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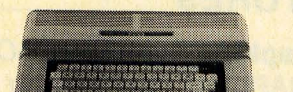

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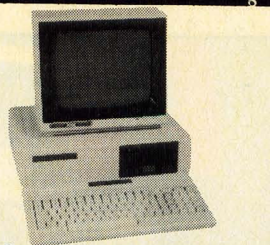

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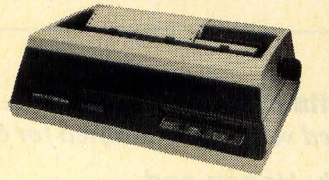

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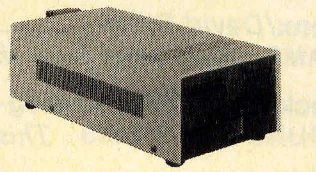

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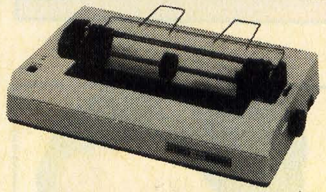

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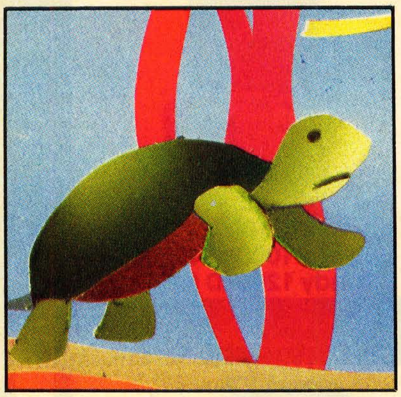

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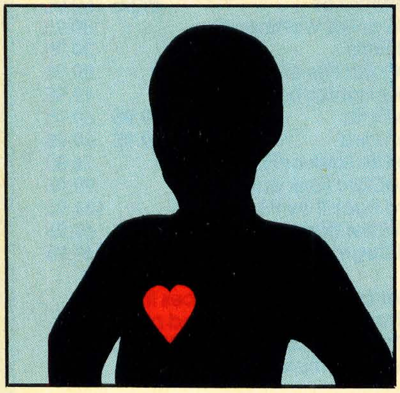

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The small cassette tape symbols beside features and regular columns indicate that the program listings with those articles are on this month's RAINBOW ON TAPE, ready to CLOAD and RUN. For full details, check our RAINBOW ON TAPE ad on Page 149.

NEXT MONTH: Get in touch with our Data Communications issue. Features will include remote driver and file-transfer communication programs, and for those involved with Ham radio, we'll have a program that determines your transmission line losses as well as entry log and QSL card generator. Wayne Day will return with his informative "CommLink" column and an up-to-date nationwide directory of bulletin board systems. Our RainbowTech section will have guest writers Bruce Warner, with a tutorial on getting started with the OS-9 operating system, and Brian Lantz, with the first of a two-part series on developing your own OS-9 utilities.

With our wide variety of games, utilities and product reviews, you can't "get the message" any better than with THE RAINBOW, the most complete source of information available anywhere for your CoCo!

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LETTERS TO THE RAINBOW

Endorsing Educational Software

Editor:

We love THE RAINBOW at our house. I am a teacher and since school has been out, I have been catching up on all of THE RAINBOWs. Our family purchased a CoCo for Christmas and what a terrific investment. We are still finding things the CoCo can do through your magazine. The CoCo without THE RAINBOW is just another computer.

I strongly urge you to have an educational software programming contest followed by another item to be added to "The Rainbow Bookshelf." At one time I had thought I would do my own programming, but there just aren't enough hours in the day to be a mother, homemaker and teacher, too. Therefore, I am looking more for programs to use in the high school classroom and home record keeping as a teacher.

Sheryl J. Smith
York, PA

Thank You, Dr. Lee, Wherever You Are

Editor:

On June 5, I was in Miami, Fla., on business. While in a computer store inquiring about THE RAINBOW Magazine and video driver/monitor interfaces for the Color Computer 2, I met a gentleman who had all the answers. He volunteered to mail me a RAINBOW subscription form and an article about monitor interfacing. I received the letter he mailed, but the envelope accidentally ended up in the trash.

I've since found a copy of THE RAINBOW . . . in Keflavik, Iceland. I want very much to thank this gentleman, but I remember neither his name nor address (Dr. Lee is the best I can do).

There are not many people who will help someone with no motive other than just being "good people." I envy his friends. Thank you.

Robert Austin
Melbourne, FL

INFORMATION PLEASE

Editor:

I would like to hear from anyone who has built the hardware project "Wireless Joysticks" (Page 105, June 1985 RAINBOW) like the one built by J.O. Shaver. If so, please write to me at P.O. Box 3841, 30721.

Randall Rhudy
Dalton, GA

Sending out an SMS

Editor:

I am unhappy and frustrated with *Musica 2* because I cannot utilize the program's full potential. I purchased the program when Speech Systems was claiming *Musica 2* would work with any printer: a claim they no longer make. When I try to print music from *Musica 2* to my C. Itoh 8510A Prowriter printer, all I get is garbage.

Richard Parry, Speech Systems owner, tried unsuccessfully for several weeks to solve the problem, even going as far as to do some modification programming on *Musica 2* to eliminate the problem. I am still unable to print music on my printer. Mr. Parry also sent me a free copy of the new version of *Musica 2* just hours after it became available. While I appreciate the gesture, I would still like to be able to print music from *Musica 2* on my Prowriter printer.

Therefore, I am sending a desperate SMS (Save My Sanity) signal to all fellow Color Computerists who also own an 8510A Prowriter printer and *Musica 2*. Can anyone throw me a life line and come to my aid? I would really appreciate any help that would solve this dilemma, as I am going down for the third time. Please write to me at 2813 Sunnydale Drive, 49085.

William T. Grace
St. Joseph, MI

HINTS AND TIPS

Editor:

One day you turn on the old CoCo and get the usual logo on the screen. You sit down and prepare yourself for a few hours of enjoyment and go to enter a command on the screen, then . . . panic stations! No matter what you do, nothing will enter on the screen. No line numbers, no list command, no directory command, nothing — just the cursor on the screen.

In a wild panic you check all the electrical connections — all tight and plugged in. All connections to the printer, tape deck, disk drive, etc. — all tight and plugged in.

You shut the machine off and on . . . nothing. You even disconnect the disk drive (after shutting the machine off, of course) and even the printer, to no avail. Still only the logo!

"Oh, no! Not a chip!" you wail in horror, "not a long down time, not now!"

Well, this of course happened to me and I suspect probably to some of you, too. Luckily, in my case, it wasn't a chip but a foolish error on my part: I had inadvertently left the joystick plugged in the night before.

Normally, this would make no difference, but this time it had gotten buried under the mess of papers and reference books that seem to grow around the machine, and the firebutton had gotten jammed against one of the books and was depressed.

When this happens, the computer will not accept any keyboard input at all (at least not the new 64K version).

Try it. Hold the firebutton down and try to type something. Hope this saves some readers an unnecessary service call or unwanted anxiety. You can be sure I unplug my joysticks after use now.

Richard F. Bellizz
Victoria, British Columbia

Dusting Up

Editor:

Quite by accident, I discovered that the cover of the 15-Cassette Storage Tray (Radio Shack #44-665) makes a perfect keyboard dust cover for my CoCo 2. Thus, for the same price as the Radio Shack Dust Cover, I now have a cover plus storage space for my favorite cassette software. Hope this will be of use to some of your readers.

Ross Whitney
Kitchener, Ontario

How to Hear the Silence

Editor:

I have an idea that may interest fellow RAINBOW ON TAPE users. Did you ever have to CLOAD five or six times to load a program, only to get an I/O Error each time because you couldn't find the silence between programs? You might end up rewinding the tape and searching from the start to load a program 100 counter units ahead! Each tape comes with a counter directory which is very useful, but it can be several units off.

If you're not successful after one or two attempts, try this: type AUDIOON and then ENTER. Disconnect the REM (remote) plug from the cassette deck and rewind the tape to five or six counter units before the start of the program you want to load. Now, when you press Play you will hear the electronic sounds of the previous program coming over your TV speaker. As soon as you hear the silence at the end of that program, stop the tape, reconnect the REM plug and type AUDIOOFF. Now you have found the silence between programs and you'll have no trouble CLOADing your program.

Rich Dextraze
New Haven, CT

Editor's Note: Thanks, Rich. A method we use a lot, and which doesn't require unplugging the cable is to type MOTORON: AUDIOON and ENTER. This starts the recorder and lets us listen in. As soon as it reaches a blank spot, we hit any key and ENTER, thus causing a deliberate syntax error which stops the recorder and cancels the AUDIO command. Then, we type CLOAD and ENTER.

Food for the Adventurer's Appetite

Editor:

First, I want to tell you how much I enjoy your magazine. It has taught me a whole lot about the CoCo. Please continue to [publish] such interesting articles.

What I am wondering about is when will the *Second Rainbow Book of Adventures* be offered to us, the Adventure fanatics? I have been waiting ever since I solved the last Adventure in your *First Book of Adventures*. I hope the second book will be out soon.

Nathan Fisher
Ponchatoula, LA

Editor's Note: *The Second Rainbow Book of Adventures* is now available. See Page 258.

BOUQUETS

Editor:

I am a custodian engineer for the New York City Public School System. I have a need for various types of software, the best of which has been my payroll program that I purchased from Howard Medical Computers. I did this after purchasing other payroll programs only to find they were hard to use or would not do the things I was led to believe they would.

The real mistake was not subscribing to your great magazine two years ago. I purchased my current payroll program (from Howard Medical Computers) after reading your review of it. I have been using it for four months and had only one problem with it. That was when New York state changed their withholding rates on July 1, 1985. I called Howard Medical Computers in Chicago expecting to be told I would have to purchase a new program. I was told by the company representative I would receive a reply as soon as possible. To my surprise and delight, I received the new tax table on a diskette with instructions on how to copy it to the original program diskette. The best part is that it was free of charge.

I have never been so pleased with a piece of software or a software manufacturer before. I would recommend to any of your readers contemplating buying a payroll program for their business that they give Howard Medical Computers a try. I am sure they will enjoy using it as much as I do.

Thomas J. Malanga, Jr.
Bayside, NY

Editor:

I would like to express my appreciation to the people at Speech Systems. I ordered EARS, *Super Voice* and their triple Y-cable, and everything got to my house within a two-week period. I never thought the CoCo would be one of the first computers to use an electronic audio recognition system device (EARS) and have one of the highest quality speech synthesizers made, but thanks to Speech Systems, the Color Computer is gaining on some of the best computers made today!

Again, I thank Speech Systems for the great job they are doing and I can hardly wait for their next project.

Blake Jurgensen
Charleston, SC

Hello Again

Editor:

I don't usually write letters, but I wanted to tell you I enjoy the magazine and RAINBOW ON TAPE! Also, a special thanks to Doug Heyza for writing *Hello*, the directory helper in the August 1985 RAINBOW [Page 69]. I've put it on all my disks and the performance is outstanding!

I'll bet it's exactly what John E. Beal of Boise, Id. ["Earth To Ed," Page 92] was looking for in his letter in the same issue. Thanks again. Please try to include a database or two for a 64K system with disk drive in future issues.

Gene Carpenter
Cropwell, AL

SPECIFIC PROGRAM SEARCH

Editor:

I was wondering if you, or perhaps your readers, may be able to help me. I am looking for a computer check list or task manager program for my 64K CoCo. In planning two major conventions and over 300 smaller meetings a year, we are constantly involved in hundreds of steps and it's all too easy to forget a deadline for mailing back a hotel room cutoff list or sending promotion copy to the printer, etc.

I am hoping for a program that could print tasks or activities in ascending or descending order, generate each person's daily, weekly or monthly responsibilities, highlight and store completed and uncompleted tasks, etc.

If anyone knows if, or where, such a program can be obtained, please write me at 38 Boileau Court, 21769.

Gary J. Heimes
Middletown, MD

Editor:

I am wondering if any company carries a pinball Simulation for the CoCo (other than Radio Shack's *Radio Ball*). I have a 64K CoCo with a disk drive. Send any information to P.O. Box 41, 45306.

Larry Wick
Botkins, OH

Caveat Emptor

Editor:

In your August 1985 issue, a number of readers mentioned problems with the United Color Computer Club. The following is a letter I have sent them regarding their new member tape. Also, it took two letters to them, after sending my check, to receive the tape. *Caveat emptor* to all CoCoers.

Jay M. Brown
Hamden, CT

United Color Computer Club
10117 S.W. 53 Court
Ft. Lauderdale, FL 33328

Gentlemen:

After sending you a two-year membership check of $50 in March and then having to remind you in June that no information was received, I finally, yesterday, received your newsletter and new member's tape.

After such a long wait, one would have expected a product worthy of what you'd call a "Worldwide Color Computer Club."

Of the 21 programs on the tape, six contain FC, IO, SN, FM, etc. Errors. One would expect some written instructions — none included.

Your original advertisement letter promised free software — yet your new member letter asks for a $10 handling charge and your regular newsletter requests $6 — this is not what I consider truth in advertising, or even free!

Your original ad claims a club library with "probably the largest collection of public domain programs available — free," yet your newsletter states you do not have a complete list of your library.

I have dealt with a number of CoCo clubs, but yours is the only one that fails to live up to its advertising, therefore, please terminate my membership and refund the $50 sent. Upon receipt of your check and it clearing my bank, I will return the new member's tape.

Very truly,
Jay M. Brown

BULLETIN BOARD SYSTEMS

Editor:

In the March 1985 "Letters to Rainbow," the numbers for my BBS and my home phone number were somehow reversed. The real number for the CoCo Pub BBS is (602) 899-1350. There is an answering machine on the other number that announces the correction.

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RAINBOW
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By George Ziniewicz
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Tired of those HO-HUM graphics programs that allow you SMALL prints? VIZIDRAW allows you 448 x 480 pixels in your COCO'S memory at one time, that's a FULL 7'' x 7'' when dumped to your printer. Similar to PRINT SHOP but at a COCO price! WHY SETTLE FOR LESS??

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No works of art, just lots of useful things that you can use to incorporate in giving your newsletters that special touch. All files are binary, you can use these with VIZIDRAW, GRAPHICOM, COCOMAX or whatever graphics utility that you're using. We recommend that you use SHRINX utility to make these any size you want.(Reviewed MARCH 1985 RAINBOW)

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GRAFPAX with G.O.G. connects to the RS-232 port of your COCO. Access all 49,152 (256 x 192) pixels. Run VIDX and digitize a pix and touch it up without going to any other graphics utility.

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The Pub has been completely redecorated into BASIC09. It runs on a CoCo 1, Multipak, RS-232 pak and PBJ *Word-Pak II* and PC-pak. The disk system is three 80-track, double-sided TEACs and a J&M Systems controller.

We support two message bases (public and private), personal mail and several download directories (Text, CoCo BASIC and OS-9). The line editor is unique; it is written to be similar to the CoCo EDIT command and supports 80-column by 50-line posts.

Please stop by the Pub real soon. If you want, send your name, address, phone and a password to me at this address: 125 S. Dobson, #1047, 85224.

Stephen Roberson
Chandler, AZ

Editor:

Are there any BBSs in the Honesdale-Carbondale-Forest City-Scranton area in Pennsylvania?

Andrew Robinson
Pleasant Mt., PA

Editor's Note: Please check Wayne Day's monthly column "Comm-Link" for new listings of BBSs. See our Communications issue, November 1984, Page 66, for a listing of BBSs in your area. Wayne's annual update will be next month.

Editor:

I would like to announce a new BBS. It's online 24 hours a day, seven days a week. The BBS is open to the general public and offers not only items of local interest, but items useful to all CoCo users. A special invitation is extended to those who may have an interest in using the CoCo in amateur radio or digital communications. The phone number is (205) 649-2894.

Terry W. Platt
Mobile, AL

Editor:

Please add our BBS to your list. Orange County Color America, 10112 Melody Park Drive, Data (714) 534-5174; 300/1200; Voice (714) 638-7889.

Fred K. Wright
Garden Grove, CA

Editor:

I would like to announce the existence of a modified Colorama; the name of this BBS is the Undersea Kingdom of Goldens Bridge. It's been up and running since January 1985 and has the following features: uploads, downloads, seven plus stories, magazine, tell me, sand writings and krash this BBS. We have almost one meg of memory and we are running 24 hours, seven days a week at 300 Baud. Call us now and check it out — (914) 232-4582.

Michael Sebar
Goldens Bridge, NY

Editor:

I am pleased to announce that a new Colorama BBS is now online. The number is (401) 765-2890. It features downloading, online games, message base, want ads, uploading, magazine section and other good stuff. It runs 24 hours, seven days a week. Users should set their parameters at seven word/one stop/no parity.

James S. Williams
Woonsocket, RI

Editor:

The DLOAD OS-9 BBS is online and available seven nights a week from 9 p.m. to 9 a.m. We have E-Mail, bulletins, graphics and, best of all, downloads. We support OS-9, BASIC09, the Model 100, C, and regular Disk Extended BASIC. The BBS has three DS 40TK drives and is running under OS-9. New users may logon at the logon prompt by hitting the ENTER key. Once on, you can leave a message to the SysOp in the Mail section to become a permanent member. Phone (803) 288-0613. Your terminal package must be able to send eight data bits and one stop bit or the BBS will not respond to your requests.

Jim Taylor
Greensville, SC

Editor:

The San Antonio Color Board is now active and in full operation 24 hours a day, seven days a week. We support program upload and download, message service, classified ads, text files, peeks and pokes, programming tricks and advice, product reviews, hardware and software purchase discounts from several sources and much more. We are operating a modified CoCo 2 with dual 80-track disk drives. We operate at either 300 or 1200 Baud. The protocol is automatically adjusted to your terminal. Call BBS (512) 674-0264; Voice (512) 674-4294.

James Leatherman
San Antonio, TX

Editor:

I would like to inform the CoCo users of the world about a new BBS. It is located in Crowsnest Pass, Alberta. The system is called "Wes-Can Color Board." It will be operational 24 hours a day, except for upkeep time. All users are welcome. We have a download section and mail; all the usual features. Give us a call at (403) 564-4118.

Ted Kyte
Blairmore, Alberta

Editor:

I am writing to let you know of a group of dedicated people in the North shore area of Sydney who call themselves "The North Shore CoCo User Group." This group has now been going for almost two years. Among our members are a number of avid OS-9 users. This BBS is online on Tuesday and Thursday evenings between 19.30 and 21.30. The times will be extended as demand warrants and the service is free to all OS-9 devotees. The phone number is 02-451-2954. Callers can leave their name, address and phone number on the "note" board and they will be called back with their password.

Graeme Nichols
Sydney, Australia

PEN PALS

Editor:

If anyone is interested in having a CoCo pen pal please write to me at 27 Cedar Road, 06913.

Jim Partridge
Clinton, CT

Editor:

I am planning on moving to Germany in January of 1986. I would be interested in meeting other CoCo/Dragon users who live in Europe. Anyone interested can contact me up until January 15, 1986, at 2708 Pinewood Drive, 20601.

Chris Ahrendt
Waldorf, MD

Editor:

Would anybody like to be pen pals or start a pen pal club? I'm 12 years old, own a 64K CoCo and would enjoy any letters. Write to me at 210 Tareyton Drive, 14850.

Zachary Perlman
Ithaca, NY

Editor:

If there is anybody who would like to have a pen pal please contact me. I am 12 years old, I have a cassette recorder and a CoCo 2. Write to me at 5860 Lanc-Kirk Road, 43105.

Jimmy Dayton
Baltimore, OH

Editor:

I want to thank you for printing my letter in the April 1985 issue of RAINBOW. I got so many wonderful letters. I answered them all and have made some really good friends.

The only thing I would like to know is, don't women use computers? I didn't hear from one woman! Is there any way to find women home computer fans who use Color Computers (64K with tapes)? My address is 115-2nd Drive S.E., 44663.

Sandra Steed
New Philadelphia, OH

Editor:

I am desperately looking for some CoCos in east Texas. If you live near or in the Lufkin area, or just want a pen pal, please write me! Since I moved from Houston to Broaddus (population 225), I haven't talked to another Color Computer owner. The best thing that happens out here is when THE RAINBOW comes each month! Write to me at P.O. Box 258, 75929.

Allen Huffman
Broaddus, TX

Editor:

I am looking for a computer pen pal. My address is Route 6, Box 293, 26505.

Doug Wilburn
Morgantown, WV

Editor:

I am always looking for pen pals, so if you are interested in the Color Computer then drop me a line to 6071 Park Avenue, H2V 4H4.

Steve Glezakos
Montreal, Quebec

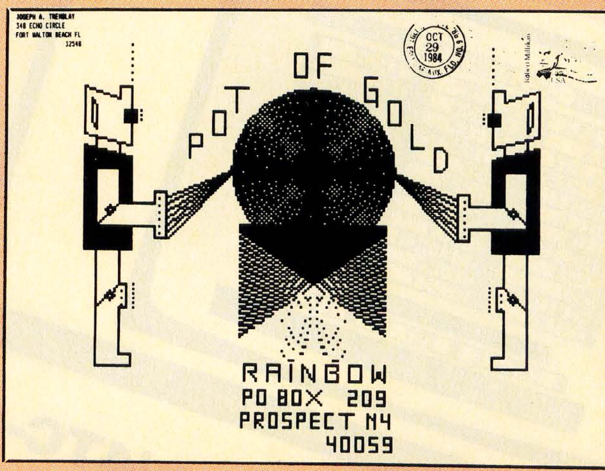
Editor:

I am writing to you to ask for a pen pal in any state of the U.S.A. I have been buying your magazine in Australia for the last six months. I have come to realize that you have better programmers over there, so I would like to be in touch with some of them.

Peter Mayer
5/246 William Street
Kingsgrove, N.S.W.
Australia, 2208

THE RAINBOW welcomes letters to the editors. Mail should be addressed to: Letters to Rainbow, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for purposes of clarity or space.

ARTS AND LETTERS



Envelope Of The Month

Joseph A. Tremblay
Fort Walton Beach, FL

It's not just

CHILD'S PLAY

but a total application software series.

It's a WORD PROCESSOR. It's a DATA BASE. It's a SPREADSHEET. And each program of the CHILD'S PLAY software series is available in three different levels of sophistication so you can custom fit CHILD'S PLAY to your individual needs.

Easy is Better!

It took us a year and a half to complete the CHILD'S PLAY series. Our goal was to produce software easy enough for a child to use, yet versatile enough for the home or professional user. The end result is software so easy, so much fun for everyone to use, it's like CHILD'S PLAY.

A Mouse and Click-Down Menus

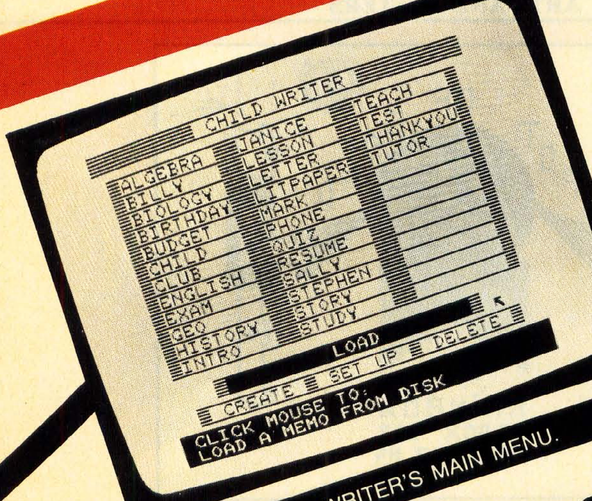
CHILD WRITER, our elementary word processor, is currently being used in schools by second grade children with amazing ease. Teachers tell us that kids are fascinated with the total control they have with a mouse. Just point and click! And we incorporated click-down menus to eliminate having to memorize dozens of commands. Simple instructions are right there on the screen, but only when you want them. Click the menu in when you need help and click it out when you don't. CHILD WRITER is not only easy to use, it's more fun and powerful.

Does your word processor underline text on the screen? All of the CHILD'S PLAY word processor programs do. For the first time you can reproduce on paper exactly what you've created on the screen. It's neat!

More Sophistication

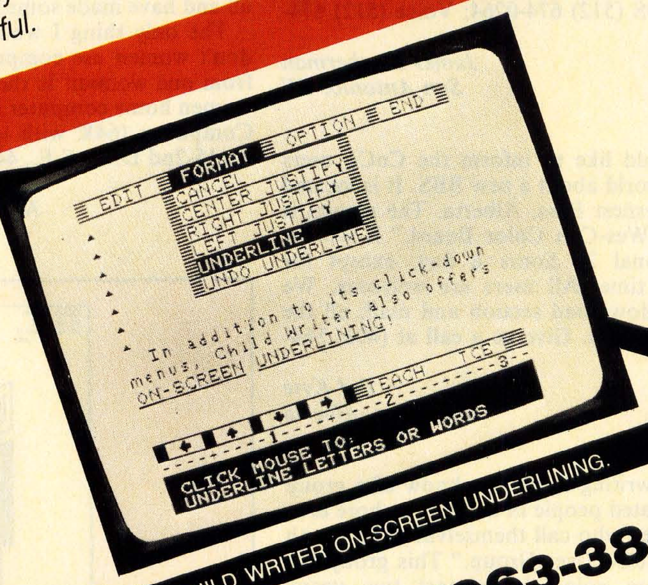
We could have stopped developing when we completed CHILD WRITER, but we knew that someone always wants more. So we developed MEMO WRITER, designed for the home user. And soon, we will have BUSINESS WRITER, the ultimate word processor designed for professional use.

MOUSE


CHILD WRITER
ALGEBRA
BILLY
BIOLOGY
BIRTHDAY
BUDGET
CHILD
CLUB
ENGLISH
EXAM
GEO
HISTORY
INTRO
JANICE
LESSON
LETTER
LITPAPER
MARK
PHONE
QUIZ
RESUME
SALLY
STEPHEN
STORY
STUDY
TEACH
TEST
THANKYOU
TUTOR
LOAD
CREATE
SET UP
DELETE

CLICK MOUSE TO:
LOAD A MEMO FROM DISK

CHILD WRITER'S MAIN MENU.


EDIT
FORMAT
OPTION
END
CANCEL
CENTER JUSTIFY
RIGHT JUSTIFY
LEFT JUSTIFY
UNDERLINE
UNDO UNDERLINE
TEACH
TCE
1
2
3

In addition to its click-down menus, Child Writer also offers ON-SCREEN UNDERLINING!

CLICK MOUSE TO:
UNDERLINE LETTERS OR WORDS

CHILD WRITER ON-SCREEN UNDERLINING.

1 800/4TC-4TCE or 301/963-3848

TCE Programs, Inc.
PO Box 2477
Gaithersburg, MD 20879 2477

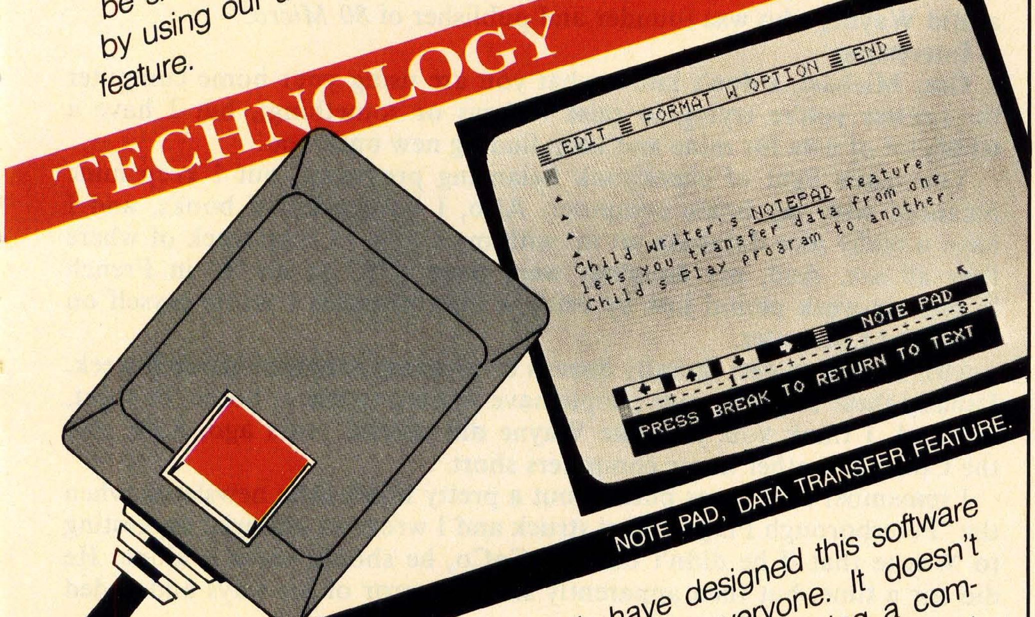
More Power
CHILD FILER and CHILD CALC are our elementary database and spreadsheet programs. LIST MANAGER and SIMPLE CALC are designed for the home user. BUSINESS MANAGER and BUSINESS CALC are for professionals.

All of these programs, no matter what level of sophistication, are completely compatible with the other CHILD'S PLAY applications on the same level. And, data can be shared between applications by using our unique NOTE PAD feature.

Available through express order at Radio Shack®.

The CHILD'S PLAY Software Series is available for the Tandy 1000.*

* Tandy 1000 is a registered trademark of Tandy Corp.



EDIT ≡ FORMAT W OPTION ≡ END

Child Writer's NOTEPAD feature lets you transfer data from one Child's Play program to another.

NOTE PAD

PRESS BREAK TO RETURN TO TEXT

NOTE PAD, DATA TRANSFER FEATURE.

NOTE PAD is the program vehicle we use to transfer data when you jump from one application to another, as well as move, cut, and paste text within your word processing program. Information from your database program is stored in NOTE PAD and made available for sharing with the other CHILD'S PLAY programs. It is a breeze to use and it sure beats retyping lots of data from one application program to another.

We have designed this software series for everyone. It doesn't matter if you are using a computer for the first time, or if you are a seasoned hacker, the CHILD'S PLAY application software series is for you. Write or call for more detailed information about the CHILD'S PLAY software series. Ask for the free TCE catalog with over 75 additional Educational Software titles. Ask about your RAINBOW discount too.

Educational Level for the Radio Shack® Color Computer

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(network version 64K)	$129.95
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BUSINESS MANAGER 64K disk	$99.95
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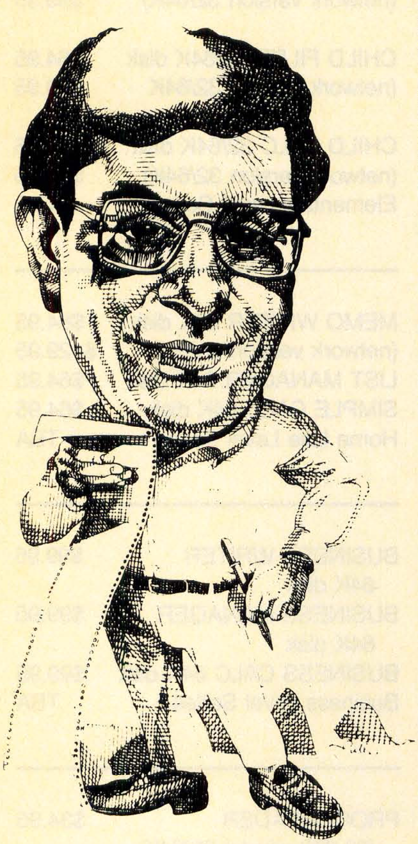

About three years ago, give or take a few months, a fellow by the name of Wayne Green figuratively "shot himself in the foot" by predicting the Color Computer was "dead" and would be discontinued by Radio Shack. That article was accompanied by many pious suggestions for Tandy personnel on how to make the CoCo's successor survive.

Is there a "Peterborough Plague" that inflicts residents of that picturesque New Hampshire hamlet every three years or so? It seems so to read the latest from Michael Nadeau, who despite being editor-in-chief of a magazine that supports our CoCo, states flatly "The fact is that most people don't *need* computers, and the computer industry has failed to come up with a good reason for consumers to buy one."

Nadeau's column, "Digressions," also includes suggestions for Tandy Corp. He concludes "It really is no wonder that the home-computer market is dead in the water."

Michael uses the same word — "dead" — and makes the same mistakes as did Wayne, who was founder and publisher of *80 Micro*.

Interesting.

Gee, Michael, I don't know what you are using your home computer for (unless you're trying to raise turkeys or something), but I have a whole lot of uses for mine and keep finding new ones, too.

You make light of checkbook balancing programs, but I keep mine balanced with my home computer. Also, I have a lot of books, and I have a really nice database set up with my CoCo to keep track of where they all are. And, my daughter went from a 'C' to an 'A' in French in one six-week period just by using a little program I wrote myself on the Color Computer.

THE RAINBOW gets literally dozens of program submissions each week. Usually these are programs people have written to use at home. In short, Michael, I think you, just like Wayne did several years ago, have sold the CoCo and other home computers short.

I remember that I was putting out a pretty brash little newsletter when the "Peterborough Plague" first struck and I wrote an editorial suggesting to Wayne that if he didn't like the CoCo, he should leave it alone. He did for a time, but then apparently saw the error of his ways and ended up starting a magazine to support it.

A lot of people never forgave Wayne Green for declaring the Color Computer to be dead. More than that, I wonder whether people should be in the Color Computer-supporting business if they don't believe in the product in the first place.

Granted, there are slower sales for CoCo right now, but *we* see new software coming from Tandy and from third-party sources as well. *We* see an excellent computer system in place. *We* see a new CoCo on the horizon that will run circles around the competition. And yes, *we* see our own business as good and the CoCo market as a strong and healthy one.

Here at THE RAINBOW, we like the Color Computer just fine.

* * *

Ever since the first issue of THE RAINBOW was published, I have sent a complimentary copy to my mother in Birmingham, Ala. For everyone who has ever sent anything you did to your mother, I am sure without exception, the critiques have ranged from "wonderful" to "absolutely wonderful."

Mom is 78 and every once in a while she will call when she is particularly

Telewriter-64™

the Color Computer Word Processor

- **3 display formats: 51/64/85 columns × 24 lines**
- **True lower case characters**
- **User-friendly full-screen editor**
- **Right justification**
- **Easy hyphenation**
- **Drives any printer**
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- **Menu-driven disk and cassette I/O**
- **No hardware modifications required**

THE ORIGINAL

Simply stated, Telewriter is the most powerful word processor you can buy for the TRS-80 Color Computer. The original Telewriter has received rave reviews in every major Color Computer and TRS-80 magazine, as well as enthusiastic praise from thousands of satisfied owners. And rightly so.

The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. The checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a 51 column by 24 line screen display with *true lower case characters.* So a Telewriter screen looks like a printed page, with a good chunk of text on screen at one time. In fact, more on screen text than you'd get with Apple II, Atari, TI, Vic or TRS-80 Model III.

On top of that, the sophisticated Telewriter full-screen editor is so simple to use, it makes writing fun. With single-letter mnemonic commands, and menu-driven I/O and formatting, Telewriter surpasses all others for user friendliness and pure power.

Telewriter's chain printing feature means that the size of your text is never limited by the amount of memory you have, and Telewriter's advanced cassette handler gives you a powerful word processor without the major additional cost of a disk.

> *...one of the best programs for the Color Computer I have seen...*
> — Color Computer News, Jan. 1982

TELEWRITER-64

But now we've added more power to Telewriter. Not just bells and whistles, but major features that give you total control over your writing. We call this new supercharged version Telewriter-64. For two reasons.

64K COMPATIBLE

Telewriter-64 runs fully in any Color Computer — 16K, 32K, or 64K, with or without Extended Basic, with disk or cassette or both. It automatically configures itself to take optimum advantage of all available memory. That means that when you upgrade your memory, the Telewriter-64 text buffer grows accordingly. In a 64K cassette based system, for example, you get about 40K of memory to store text. So you don't need disk or FLEX to put all your 64K to work immediately.

64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24!! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command.

The 51 × 24 display is clear and crisp on the screen. The two high density modes are more crowded and less easily readable, but they are perfect for showing you the exact layout of your printed page, *all on the screen at one time.* Compare this with cumbersome "windows" that show you only fragments at a time and don't even allow editing.

RIGHT JUSTIFICATION & HYPHENATION

One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.

Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

FEATURES & SPECIFICATIONS:

Printing and formatting: Drives any printer (LPVII/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Terminet, etc).

Embedded control codes give full dynamic access to intelligent printer features like: underlining, subscript, superscript, variable font and type size, dot-graphics, etc.

Dynamic (embedded) format controls for: top, bottom, and left margins; line length, lines per page, line spacing, new page, change page numbering, conditional new page, enable/disable justification.

Menu-driven control of these parameters, as well as: pause at page bottom, page numbering, baud rate (so you can run your printer at top speed), and Epson font. "Typewriter" feature sends typed lines directly to your printer, and Direct mode sends control codes right from the keyboard. Special Epson driver simplifies use with MX-80.

Supports single and multi-line headers and automatic centering. Print or save all or any section of the text buffer. Chain print any number of files from cassette or disk.

RAINBOW
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SEAL

File and I/O Features: ASCII format files — create and edit BASIC, Assembly, Pascal, and C programs, Smart Terminal files (for uploading or downloading), even text files from other word processors. Compatible with spelling checkers (like Spell 'n Fix).

Cassette verify command for sure saves. Cassette auto-retry means you type a load command only once no matter where you are in the tape.

Read in, save, partial save, and append files with disk and/or cassette. For disk: print directory with free space to screen or printer, kill and rename files, set default drive. Easily customized to the number of drives in the system.

Editing features: Fast, full-screen editor with wordwrap, block copy, block move, block delete, line delete, global search and replace (or delete), wild card search, fast auto-repeat cursor, fast scrolling, cursor up, down, right, left, begin line, end line, top of text, bottom of text; page forward, page backward, align text, tabs, choice of buff or green background, complete error protection, line counter, word counter, space left, current file name, default drive in effect, set line length on screen.

Insert or delete text anywhere on the screen without changing "modes." This fast "free-form" editor provides maximum ease of use. Everything you do appears immediately on the screen in front of you. Commands require only a single key or a single key plus CLEAR.

> *...truly a state of the art word processor... outstanding in every respect.*
> — The RAINBOW, Jan. 1982

PROFESSIONAL WORD PROCESSING

You can no longer afford to be without the power and efficiency word processing brings to everything you write. The TRS-80 Color Computer is the lowest priced micro with the capability for serious word processing. And only Telewriter-64 fully unleashes that capability.

Telewriter-64 costs $49.95 on cassette, $59.95 on disk, and comes complete with over 70 pages of well-written documentation. (The step-by-step tutorial will have your writing with Telewriter-64 in a matter of minutes.)

To order, send check or money order to:

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Or check your local software store. If you have questions, or would like to order by Visa or Mastercard, call us at (619) 755-1258 (weekdays, 8AM-4PM PST). Dealer inquiries invited.

(Add $2 for shipping. Californians add 6% state tax.

Now available at Radio Shack stores via express order

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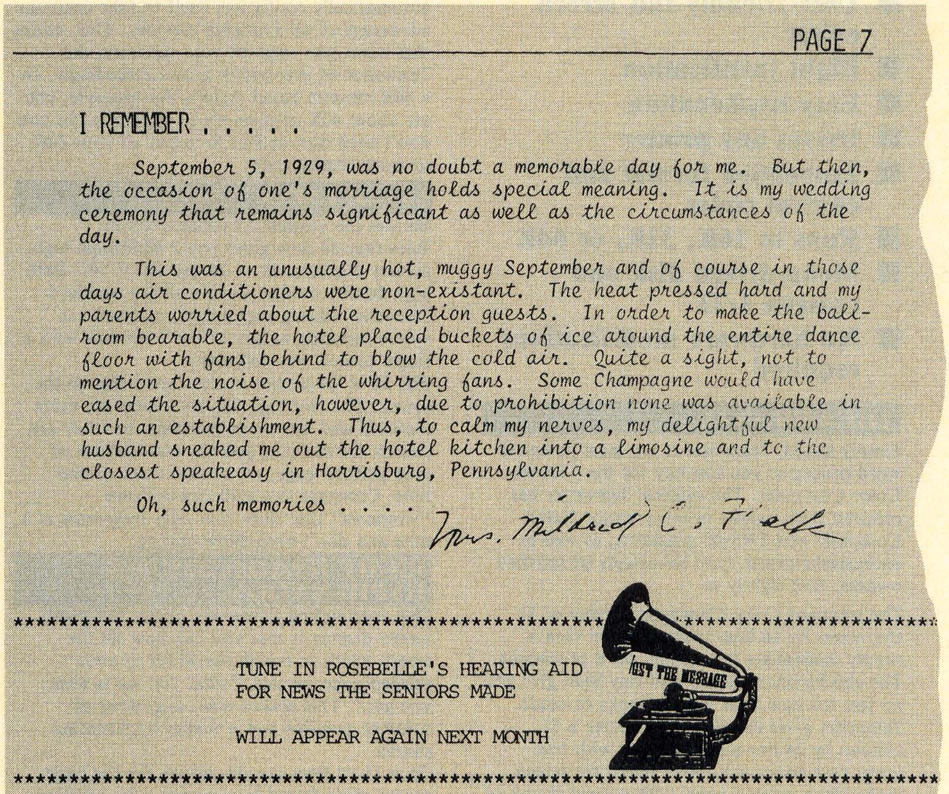
impressed with an issue to say: "I really don't understand all this computer stuff, but this is really a wonderful magazine. And, your Uncle Herb in Baltimore thinks so, too."

Mom has saved just about everything I've ever written. Which, considering all the time I've spent writing things, is quite a lot of stuff. But, in all that time, *she's* never written anything (except letters) — until now.

Mom's first journalistic effort is reproduced below. I know it doesn't apply to anything having to do with THE RAINBOW, the CoCo or computers. But, she's my Mom and it's her "first" article ever.

It is obviously a vignette from another time. Hey, Mom, it took you 78 years, but welcome to the profession of journalism. Not a badly done debut!



PAGE 7

I REMEMBER . . . . .

September 5, 1929, was no doubt a memorable day for me. But then, the occasion of one's marriage holds special meaning. It is my wedding ceremony that remains significant as well as the circumstances of the day.

This was an unusually hot, muggy September and of course in those days air conditioners were non-existant. The heat pressed hard and my parents worried about the reception guests. In order to make the ballroom bearable, the hotel placed buckets of ice around the entire dance floor with fans behind to blow the cold air. Quite a sight, not to mention the noise of the whirring fans. Some Champagne would have eased the situation, however, due to prohibition none was available in such an establishment. Thus, to calm my nerves, my delightful new husband sneaked me out the hotel kitchen into a limosine and to the closest speakeasy in Harrisburg, Pennsylvania.

Oh, such memories . . . .

Mrs. Mildred C. Falk

****

TUNE IN ROSEBELLE'S HEARING AID
FOR NEWS THE SENIORS MADE

WILL APPEAR AGAIN NEXT MONTH

****

Reprinted from the August 1985 *Futures Unlimited*, senior adult newsletter.

One of the neatest pieces of productivity software we've seen is a program called *DeskMate*, which is bundled with the Tandy 1000 and has been an instant hit. Watch for Tandy to soon offer a version of this outstanding program for the CoCo, too.

To me, it is just another example of Radio Shack's commitment to the CoCo. *DeskMate* is a combination of a spreadsheet, word processor, telecommunications program, daily appointment calendar and other tools.

You should be able to see it up close and personal at RAINBOWfest in Princeton, N.J., Oct. 11-13. Which reminds me, I hope you are planning to be with us for this great show. We're really excited about it, and especially about the acceptance by Bill Barden to be our CoCo Community Breakfast speaker.

Bill, as you know, is one of the biggest names in the computer world and he will be our special guest all during RAINBOWfest. This is really an extra bonus and I hope you'll take advantage of it.

Breakfast tickets, though, are limited. It isn't hype when I urge you to order now. I fully expect a sell-out.

— Lonnie Falk

TOP RATINGS
HOT COCO MAGAZINE
SEPTEMBER 1984

YOU COULD FALL IN LOVE WITH

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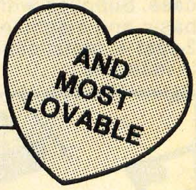
WORLD'S SMARTEST TERMINAL



GOOD LOOKIN'

AUTOTERM shows true upper/lower case in screen widths of 32, 40, 42, 51, or 64 characters with no split words. The width of 32 has extra large letters. Scrolling is forward, backward, and fast. Block graphics pictures are displayed automatically and can be scrolled.

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KEY-BEEP can be on/off. Unacceptable keystrokes cause a lower pitched BOP! This ERROR-BEEBOP can be on/off.

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DUAL PROCESSING lets you review & edit while more data is coming in.

Fully supports D.C. Hayes and other intelligent modems.

Talks to your printer with any page size, margins, line spacing, split word avoidance. Embed your printer's control sequences for boldface, underlining, etc. Narrow text can be automatically spread out.

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Compatible with TELEWRITER (ASCII) & other word processors.

SMOOTH WALKIN'

AUTOTERM moves smoothly and quickly between word processing and intelligent terminal action. Create text, correct your typing errors; then connect to the other computer, upload your text, download information, file it, and sign-off; then edit the received data, print it in an attractive format, and/or save it on file.

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PUTTY IN YOUR HANDS

The word processor can be used to create, print, and/or save on file your personal KSMs. They let AUTOTERM act like you. For example, it can dial through your modem, sign-on, interact, perform file operations, & sign-off; an entire session without your help. KSMs can answer the phone, prompt the caller, take messages, save them, hang-up, and wait for the next call. The KSM potential is unbelievable!

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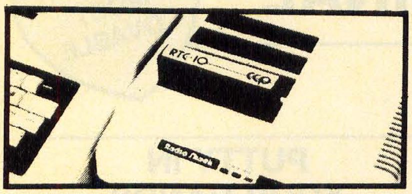

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BUILDING OCTOBER'S RAINBOW

Pyramid Pow(d)er . . .
The RainbowTech Disk . . .
Nearing the Billion-Page Mark . . .

Since this is, after all, a "building" column, let's discuss the latest building theory. I came upon it in the June *Reader's Digest*. It seems a scientist now claims that the pyramids may have been built out of concrete! I kid you not; that's what he says and, so far, I haven't heard anything about his being disproved.

Concrete! Give me a break. If chemist Joseph Davidovits of Barry University in Miami Shores, Fla., turns out to be right, he should get a handsome award, but the rest of the geologists and archaeologists who've pondered the "riddle of the centuries" should turn in their pith helmets — or be ridden out of town on a rail. Scientific hint: Look for some initials in the corners of the blocks, guys.

Legions of slaves heaving countless six-ton limestone slabs, indeed. It may turn out that the oldest of the so-called seven wonders of the world was built using a team of camels pulling a ready-mix wagon. Davidovits believes the pyramid builders filled wooden molds with a slurry of crushed limestone mixed with a mineral binder. In fact, this theory may explain why the pyramid stones are filled with tiny air bubbles not found in the quarry from which they reportedly came. Don't ask me why the high priests of the scientific temples can't tell man-made poured cement from natural rock, but I can't say I'm not surprised, because I am. This shakes up some old foundations, including my belief in science as a science.

If this cement theory holds together, move over Piltdown Man, because this guy may have uncovered the Hoax of the Ages. Stretching across the centuries for a segue, I'd like some concrete ideas from you readers on how to solve a problem that seems to be pyramiding here at THE RAINBOW. You see, we're considering something I've tentatively dubbed the *RainbowTech Disk*, a new service, and we'd like to do it right the first time.

Often, we get letters asking why we don't put assembly language source code on RAINBOW ON TAPE. The most recent plea comes from Jacques Labonte of Acton Vale, Quebec. He makes a good case for providing source code on magnetic media. I agree that there's a need, but I don't think RAINBOW ON TAPE is the vehicle. Of the thousands who avail themselves of this service each month, too many are rank beginners who would pull their hair out trying to `CLOAD` and `RUN` source code. No, they need the assembled, running binary file — only. There's more to it than that, though.

Others are asking regularly when we are going to offer OS-9 programs ready to load and run. Can't do that on tape, can you? At least, not readily. Besides that, still others want templates for spreadsheets and database managers, and the growing following of "CoCo Gallery" wants these picture data files ready to load in and view, but many of these are very long and useful only to those who have the programs to load them. So, there is a wide variety of programming material — some I haven't even mentioned — we need to package in some convenient way.

Enter the *RainbowTech Disk*, a sort of high-tech service for specialized interests, a diversified magnetic assemblage of computer odds and ends. How to do it? Well, we have a couple of avenues for getting both OS-9 and Disk BASIC files all on the same disk, without even flipping the floppy, but then maybe you know a better way. Also, is this something you'd like to have? And, what else would you want on this "hard-core hackers" service? Let us hear from you; at this point, nothing is carved in stone.

To this brief treatise, my usual footnote: Join the legions of RAINBOW subscribers and we'll order our scribes to parcel out, just for you, a special monthly ration of the almost 300,000,000 pages we print annually — almost a billion pages since we launched a four-page newsletter in June 1981.

— Jim Reed

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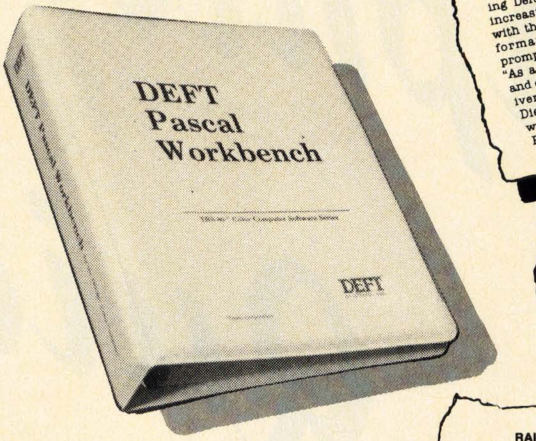

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HOT CoCo Magazine - (March 1985)

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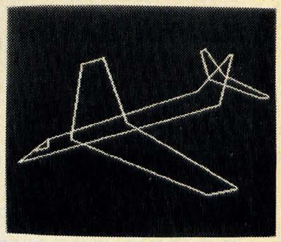

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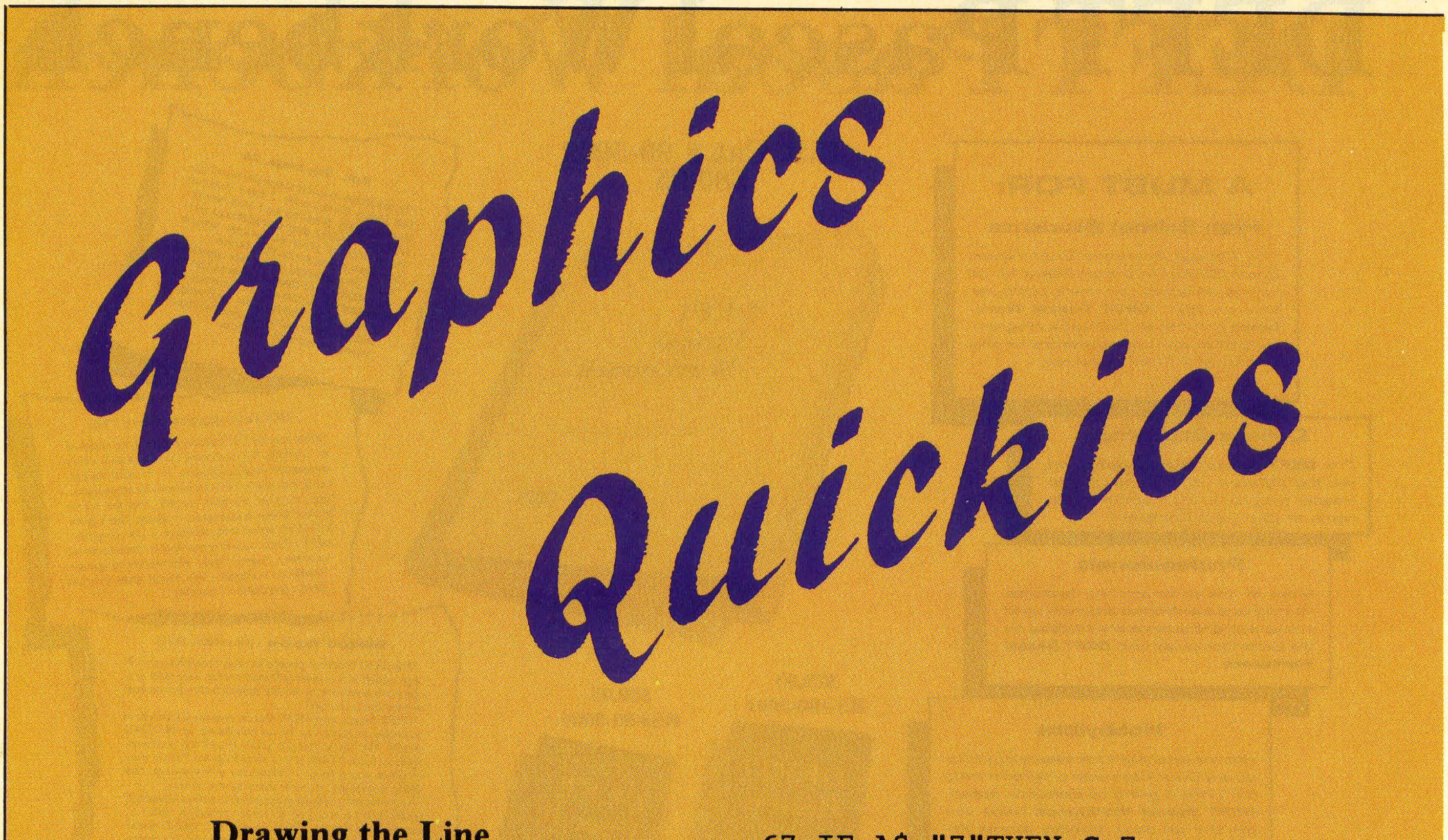


Graphics Quickies

Drawing the Line

By Jimmy McGill

The following is a Lo-Res line drawing program. Simply use the arrow keys to move up, down, left and right; use the number keys '1' through '8' to select the desired color ('0' will switch to black).

The listing: LINEDRAW

4K

```
10 CLS(0)
15 A=31
17 B=15
20 A$=INKEY$
30 IF A$=""THEN GOTO 20
50 REM DIRECTIONS
51 IF A$=CHR$(94)THEN B=B-1:IF B
<0 THEN B=0
52 IF A$=CHR$(10)THEN B=B+1:IF B
>31 THEN B=31
53 IF A$=CHR$(8)THEN A=A-1:IF A<
0 THEN A=0
54 IF A$=CHR$(9)THEN A=A+1:IF A>
63 THEN A=63
60 REM COLORS
61 IF A$="1"THEN C=1
62 IF A$="2"THEN C=2
63 IF A$="3"THEN C=3
64 IF A$="4"THEN C=4
65 IF A$="5"THEN C=5
66 IF A$="6"THEN C=6
67 IF A$="7"THEN C=7
68 IF A$="8"THEN C=8
69 IF A$="0"THEN GOSUB 100
70 SET(A,B,C)
80 GOTO 20
100 RESET(A,B):GOTO 20
```

Read My Lips!

By Bill Bernico

The following program is a graphics display of a fellow named "KoKo" (sound familiar?) who will "spit out" sentences from the user's input information. The fascinating part of the program is the way the information is presented.

For ambitious programmers who would like to substitute different sentences, the programming techniques used are listed below.

Line	Description
80-150	Accepts user input and assigns to variables
170-200	Draws KoKo
210	Allows 20 spaces before the printing begins
220	Holds the framework of the sentence and variables from the user input
240	Creates the sound and prints at 256, the sentences created in Line 220

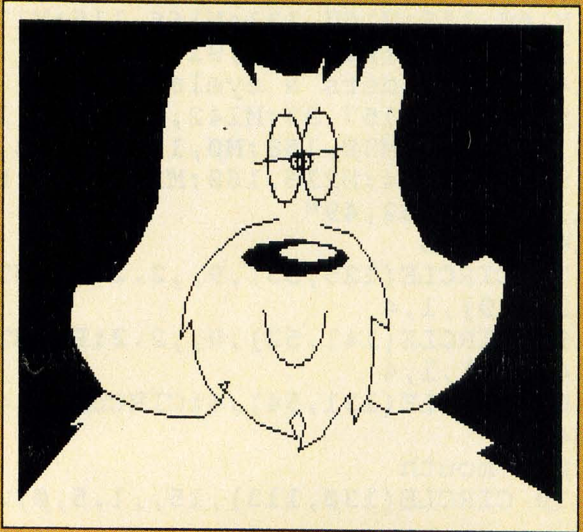
The listing: SPEAK2ME

16K
ECB

```
10 'SPEAK TO ME
20 'BY BILL BERNICO
30 '708 MICHIGAN AVE.
40 'SHEBOYGAN, WI 53081
50 '(414) 459-7350
60 '
70 CLEAR 1000
80 CLS:PRINT"WHAT IS YOUR NAME":
INPUT N$
90 CLS
100 CLS:PRINT"HOW OLD ARE YOU":I
NPUT X$
110 CLS:PRINT"ARE YOU A BOY OR G
IRL":INPUT"(B/G)";BG$
120 IF BG$="B"THEN BG$="BOY"ELSE
IF BG$="G"THEN BG$="GIRL"ELSE BG
$="PERSON"
130 CLS:PRINT"WHAT STREET DO YOU
 LIVE ON":INPUT Z$
140 CLS:PRINT"WHAT CITY DO YOU L
IVE IN":INPUT CT$
150 CLS:PRINT"WHAT STATE IS THAT
 IN":INPUT ST$
160 B$=CHR$(128):Y$=CHR$(159):E$
=CHR$(157)
170 CLS:PRINT@51,STRING$(8,128):
PRINT@82,STRING$(10,128):PRINT@1
13,STRING$(12,128):PRINT@146,Y$;
Y$;Y$;STRING$(8,128)
180 PRINT@178,;Y$;E$;Y$B$;B$;Y$;
STRING$(5,128):PRINT@209,STRING$
(8,159);STRING$(4,128)
190 PRINT@242,STRING$(10,159):PR
INT@275,STRING$(9,159):PRINT@306
,STRING$(9,159):PRINT@340,STRING
$(7,159):PRINT@372,STRING$(7,159
)
200 PRINT@402,STRING$(11,255):PR
INT@433,STRING$(13,175):PRINT@46
5,STRING$(13,255):PRINT@496,STRI
NG$(15,175);
210 FOR U=1 TO 20:Q$=Q$+CHR$(143
):NEXT U
220 S$="HELLO "+N$+", MY NAME IS
 KOKO. I'LL BE VISITING "+Z$+" S
TREET WHEN I'M IN "+CT$+" NEXT W
EEK. I'M LOOKING FOR A "+BG$+" A
BOUT "+X$+" YEARS OLD TO HELP ME
 FIND THE CAPITAL OF "+ST$+"."
230 L$=Q$+S$+Q$
240 FOR P=1 TO LEN(L$)-19:SOUND
RND(9)+180,2:PRINT@256,MID$(L$,P
,19);:NEXT P
250 PRINT@481,"aNOTHER OR eND";
260 W$=INKEY$:IF W$="A"THEN 10 E
LSE IF W$="E"THEN 270 ELSE 260
270 CLS:PRINT"BYE, ";N$
280 PRINT"SEE YA LATER
```

It's Charlie the Canadian Dog, Eh!

By Ray Larabie



Charlie's picture can be dumped to a printer for color or black-and-white printouts using a screen dump program.

The listing: CHARLIE

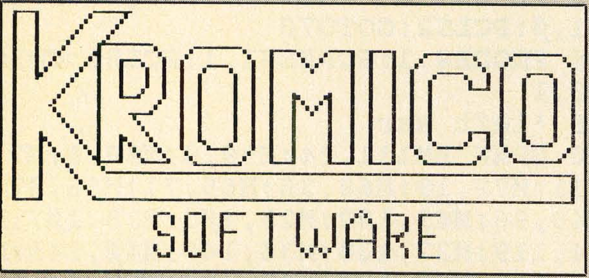
16K
ECB

```
10 'CHARLIE (C) COPYRIGHT 1985 R
AY LARABIE ALL RIGHTS RESERVED
20 CLS:PRINT"CHARLIE (C) 1985 RA
Y LARABIE":PRINT"  ALL RIGHTS RE
SERVED"
30 INPUT"BLACK & WHITE OR COLOR
(B/C)";A$
40 IF A$="C" THEN PMODE3,1:SCREE
N1,0:PCLS2:GOTO70
50 PMODE4,1:SCREEN1,1:PCLS1:COLO
R0,1
60 'left ear
70 DRAW"BM111,24;M98,8;M89,8;M79
,11;M72,19;M68,36;M65,71;M56,87;
M49,96;M43,102;M28,103;M25,107;M
24,119;M27,128;M36,140;M40,145;M
56,152;M72,155;M87,155;M95,149"
80 'right ear
90 DRAW"BM159,24;M164,12;M172,8;
M175,9;M180,16;M182,24;M180,32;M
177,44;M180,67;M191,86;M208,95;M
220,90;M228,95;M229,99;M227,111;
```

```
M222,124;M208,139;M188,151;M176,
153;M165,148"
100 'brow
110 DRAW"BM111,24;M110,15;M125,2
0;M140,19;M144,11;M143,23;M156,1
1;M159,13;M159,24"
120 'snout
130 DRAW"BM122,77;M107,80;M98,86
;M91,92;M83,100;M78,111;M76,124;
M81,117;M83,132;M89,143;M95,149;
M99,141;M94,142;M112,157;M131,16
3;M128,156;M132,152;M135,158;M13
2,168;M142,163;M156,145;M158,157
;M165,145;M167,131;M166,115;M174
,120;M172,104;M164,91
140 'shoulders & eyelashes
150 DRAW"M157,83;M142,79;BM40,14
5;M22,160;M30,158;M0,188;BM193,1
48;M225,164;M216,168;M255,187;BM
111,55;M152,49"
160 'eyes
170 CIRCLE(125,53),9,,2.2:PAINT(
125,49),1,4
180 CIRCLE(141,52),9,,2.2:PAINT(
141,47),1,4
190 CIRCLE(131,54),4:CIRCLE(134,
54),4
200 'mouth
210 CIRCLE(130,113),15,,1.5,0,.5
0
220 'nose
230 CIRCLE(136,90),15,,.3:CIRCLE
(130,92),25,,.3:PAINT(130,95),,0
240 IF A$="C" THEN PAINT(0,0),3,
4 ELSE PAINT(0,0),0,0
250 'end
260 FORX=255TO1STEP-1:Y=Y+1:POKE
140,X:EXEC43345:POKE140,Y:EXEC43
345:NEXTX:Y=0:GOTO260
```

Title Page Power

By Bill Bernico



One thing every program needs is an eye-catching title page. *Kromico* uses the DRAW and PAINT method that puts the title on the screen, paints the letters, switches to an alternate screen and starts over with another color, giving you a possibility of 24 different screen presentations. Use the power of your CoCo to spruce up those title pages!

The listing: KROMICO

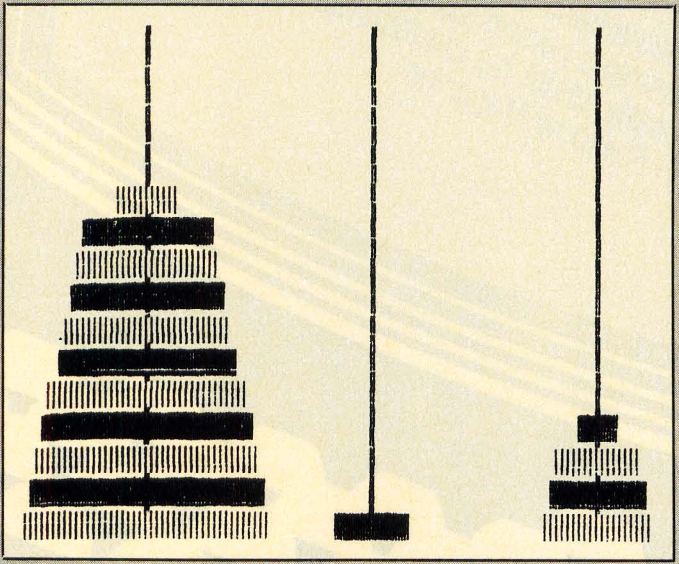
16K ECB

```
10 'KROMICO
20 'EXAMPLES OF GRAPHIC TITLES
30 'BY BILL BERNICO
40 '708 MICHIGAN AVE.
50 'SHEBOYGAN, WI 53081
60 '(414) 459-7350
70 '
80 PMODE3,1:SCREEN1,1:PCLS
90 X=1 'START PAINTING WITH COLO
R #1
100 'LINES 110-240 DRAW AND PAIN
T "KROMICO" IN FAT LETTERS
110 DRAW"BM2,1D70R12U25F25R214U1
0L209H25E35L16G25U25L11" 'K
120 PAINT(6,7),X,4
130 DRAW"BM40,57U44R25F6D14G6L10
F18L12H10D10L8BU38BR8R8F4D6G4L8U
14" 'R
140 PAINT(44,55),X,4
150 DRAW"BM78,52U32E6R20F6D32G6L
20H6BR10BU2UF3R8E3U25H3L9G3D25"
'O
160 PAINT(80,52),X,4
170 DRAW"BM118,57U42R10F8E8R10D4
2L10U26G8H8D26L10" 'M
180 PAINT(120,55),X,4
190 DRAW"BM163,57U42R10D42L10" '
I
200 PAINT(165,55),X,4
210 DRAW"BM180,46U23E7R20F7D6L8U
3H3L11G3D22F3R11E3U3R8D6G6L21H6U
4" 'C
220 PAINT(182,44),X,4
230 DRAW"BM221,50U28E6R20F6D28G6
L20H6BR10BU2UF3R8E3U21H3L9G3D21"
 'O
240 PAINT(224,52),X,4
250 'LINES 260-330 DRAW "SOFTWAR
E" IN SMALLER LETTERS (NO PAINTI
NG)
260 DRAW"BM75,80U2H2L4G2D4F2R4F2
D4G2L4H2U2" 'S
270 DRAW"BR14D2F2R4E2U12H2L4G2D1
1" 'O
280 DRAW"BR16D3U9NR6U7R9" 'F
290 DRAW"BR7R11L6D16U16BR12" 'T
300 DRAW"D12F4E4NU6F4E4U12BD16BR
7" 'W
310 DRAW"U12E5F6D5NL9D6" 'A
320 DRAW"BR6U16R6F2D4G2L6R2F6D2"
 'R
330 DRAW"BR6NR9U8NR6U8R9" 'E
340 GOSUB440 'TIME DELAY
350 'LINES 360-400 TRY DIFFERENT
```

```
 SCREEN STYLES
360 PMODE4,1:SCREEN1,0:GOSUB440
370 PMODE1,1:SCREEN1,1:GOSUB440
380 PMODE4,1:SCREEN1,1:GOSUB440
390 PMODE3,1:SCREEN1,0:GOSUB440
400 PMODE1,1:SCREEN1,0:GOSUB440
410 X=X+1 'AFTER ALL 6 SCREEN ST
YLES ARE TRIED, PAINT WITH A DIF
FERENT COLOR
420 IF X>4THEN 80 'REPEAT AFTER
ALL FOUR COLORS ARE TRIED
430 PMODE3,1:SCREEN1,1:PCLS:GOTO
110 'ERASE SCREEN AND START OVER
440 FORT=1TO1500:NEXTT:RETURN
```

The Towers of Hanoi

By David Cromley



The following is a graphics demonstration of the "Towers of Hanoi" puzzle. The object is to move all the discs on the left rod over to the right rod in the same order that they were in at the beginning. This shows how the puzzle can be solved.

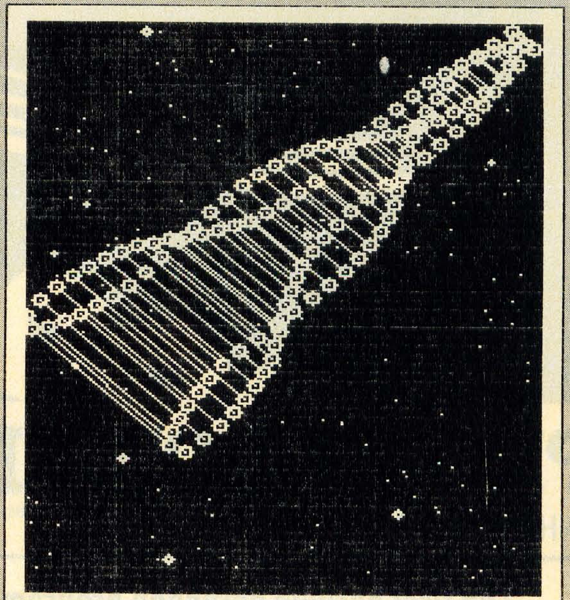
The listing: HANOI

16K ECB

```
100 '--TOWERS OF HANOI
110 '  D-C DAVID A CROMLEY, 1984
120 PCLEAR 4: PMODE 3,1: COLOR 3
,2
130 PCLS: SCREEN 1,0
140 N=08: NR=N: DIM TN(3),TS(3,1
6),TC(3,16)
150 FOR X=43 TO 213 STEP 85
160 LINE (X,0)-(X,191),PSET: NEX
T X
170 T1=2: T3=1: FOR I=1 TO N: TN
(2)=1
180 TS(2,1)=I: TC(2,1)=I-INT(I/3
)*3+3
190 GOSUB 220: NEXT I
200 T1=1: T2=2: T3=3: GOSUB 340
210 GOTO 210
220 '--MOVE ONE DISC
230 N1=TN(T1): N3=TN(T3)+1
240 TN(T1)=N1-1: TN(T3)=N3
250 XS=TS(T1,N1): TS(T3,N3)=XS
260 XC=TC(T1,N1): TC(T3,N3)=XC
270 X1=T1*85-42: X3=T3*85-42
280 Y1=194-N1*12: Y3=194-N3*12
290 XR=44-INT(XS/NR*19)*2
300 COLOR XC,2: FOR Y=0 TO 9
310 LINE (X1-42,Y1+Y)-(X1+42,Y1+
Y),PRESET
320 LINE (X3-XR,Y3+Y)-(X3+XR,Y3+
Y),PSET
330 PSET (X1,Y1+Y,3): NEXT Y: RE
TURN
340 '--SUBROUTINE
350 IF N=0 THEN RETURN
360 T=T2: T2=T3: T3=T: N=N-1: GO
SUB 340
370 T=T2: T2=T3: T3=T: GOSUB 220
380 T=T1: T1=T2: T2=T: GOSUB 340
390 T=T1: T1=T2: T2=T: N=N+1: RE
TURN
```

Space Waves

By Joey Goodson



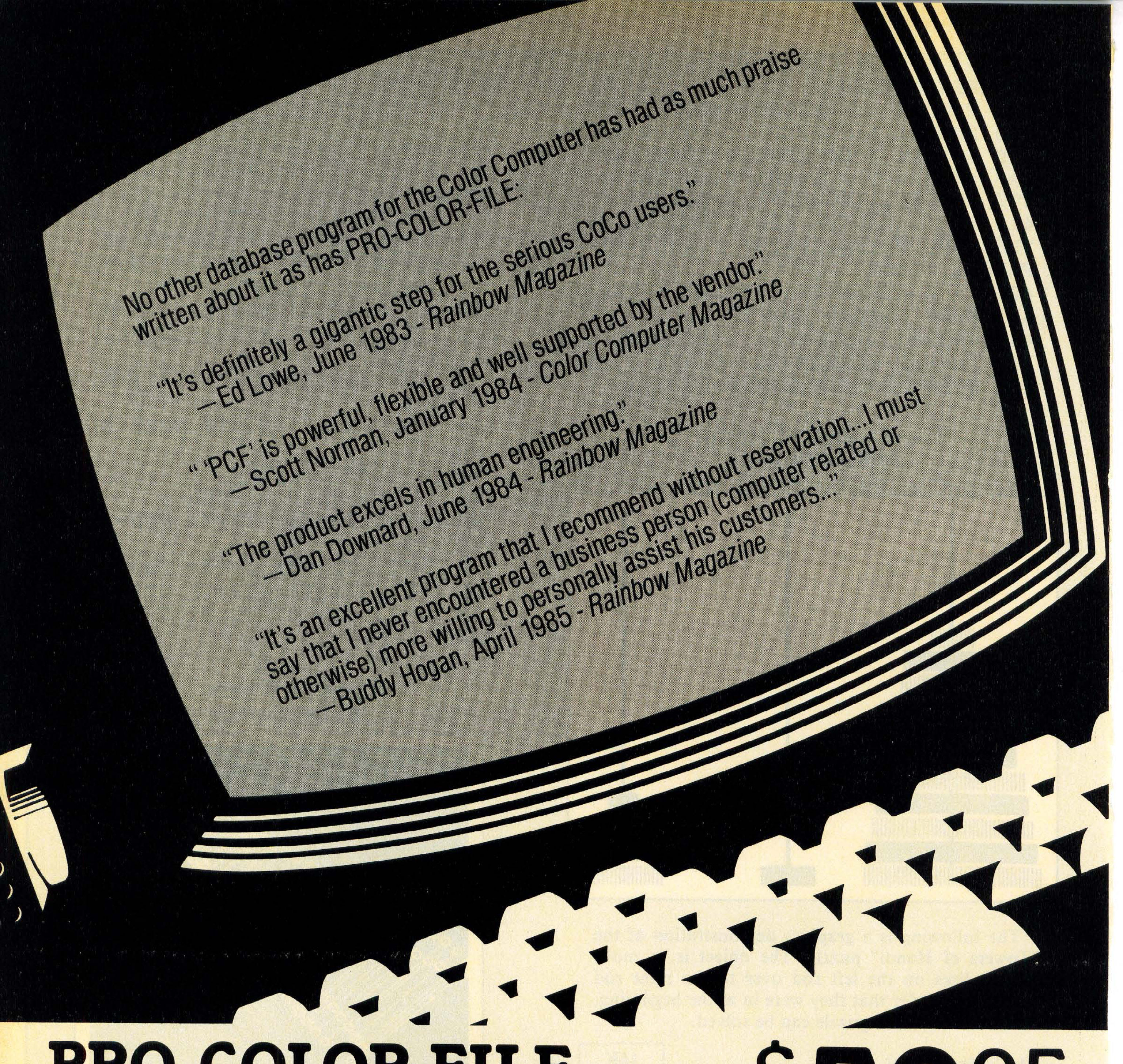
Rcircsin draws sine wave designs on an outerspace background and plays a short sound effect. The design is erased and then starts over with a new picture.

For quicker drawings, POKE 65495,0.

The listing: RCIRCSIN

16K ECB

```
1 '*RCIRCSIN* - BY JOEY GOODSON
2 A=RND(-TIMER)
4 G=10:R=3
```



No other database program for the Color Computer has had as much praise written about it as has PRO-COLOR-FILE:

"It's definitely a gigantic step for the serious CoCo users."
—Ed Lowe, June 1983 - *Rainbow Magazine*

" 'PCF' is powerful, flexible and well supported by the vendor."
—Scott Norman, January 1984 - *Color Computer Magazine*

"The product excels in human engineering."
—Dan Downard, June 1984 - *Rainbow Magazine*

"It's an excellent program that I recommend without reservation...I must say that I never encountered a business person (computer related or otherwise) more willing to personally assist his customers..."
—Buddy Hogan, April 1985 - *Rainbow Magazine*

PRO-COLOR-FILE

ENHANCED 2.0

© 1984 by Derringer Software, Inc.

$59.95

The first serious database program available for the Color Disk System and, since its introduction in November 1982, it has remained the popular choice of the Color Computer user.

- 60 Data Fields for each record
- 1020 spaces available per record if needed
- Maximizes multiple drive operation
- 28 equation lines (+ − * /)
- IF-THEN-ELSE logic tests in equations
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- Stores custom designed report formats
- Obtain totals, averages, or summaries for any field
- Output reports to printer, screen, or disk file
- Send data out to a DYNACALC compatible file
- Separate label generator for up to 10 across labels.
- Pre-define up to 16 indexes for searching/reporting file
- Sorts 750 records in under 5 minutes
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PRO-COLOR-FORMS will access data files created with PRO-COLOR-FILE and merge them with a letter or place them on pre-printed forms.

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You can use the built in ML text editor for creating the form or use your favorite word processor.

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PRO-COLOR-DIR will read your directories and create a master data file that can be accessed by PRO-COLOR-FILE for sorting and reporting. 1000 + records can be stored on one diskette with valuable information about each program.

• DISK ID NAME • FILENAME/EXT • TYPE OF FILE • DATE CREATED • DATE UPDATED • NUMBER OF GRANS ALLOCATED • NUMBER OF SECTORS ALLOCATED AND USED • MACHINE LANGUAGE ADDRESSES •

You can obtain hard copies of the information and create labels of the filenames for placing on the diskette itself.

$21.95

Buy all 3
in the
PRO-COLOR-SERIES

$99.95

MASTER DESIGN

©1984 by Derringer Software, Inc.

This graphics program does more for you than just hi-res graphic editing. It will generate lettering in hi-res graphics that can be different sizes, skinny, bold, textured, drop shadowed, raise shadowed or tall. It will also interface with the Telewriter-64 word processor for printing hi-res displays with your letters.

As a graphics editor, it takes full advantage of all the extended BASIC hi-res graphic commands. Create boxes, circles, lines, copy displays and utilize GET and PUT features. Some added commands include mirror reflection, turn displays backwards or upside down. Squish displays, create dot patterns for shading or diagonal lines for creative backgrounds.

Special text files created with the Letter Head Utility allow you to access hi-res graphics from Telewriter-64, your own BASIC programs or PRO-COLOR-FORMS.

Interfaces with all popular dot matrix printers that have dot addressable graphic ability.

See reviews in:
July '84 Rainbow, Oct. '84 Hot CoCo **$29.95**

DYNAGRAPH

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A Utility program for owners of DYNACALC®

DYNAGRAPH will transfer graphic files from DYNACALC to standard graphic files for further enhancing and labeling by graphic editing programs such as MASTER DESIGN, CoCo Max or Graphicom.

DYNAGRAPH can also reduce a graph vertically and horizontally so that multiple displays can be combined into one.

$19.95

(included FREE with DYNACALC®)

SIDEWISE

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SIDE WISE makes your printer do something you never thought possible—print side ways! Print out an ASCII stored spread sheet file that has up to 255 characters per row for easier viewing. No more hassles with trying to hold sheets together!

SIDE WISE will read in any ASCII text file and print it out side ways using a Radio Shack, Epson, Okidata, C-Itoh or Gemini printers having dot-graphics ability. SIDE WISE reads any ASCII file including BASIC programs and word processor files.

Add a new "twist" to your printer's capabilities!

(Disk Only) **$24.95**

SIMON

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SIMON will "watch" you run through any BASIC program and keep track of every keystroke you make. The keystrokes can be saved in a disk file so the next time you want to perform the same procedure, SIMON will do it for you.

A custom menu can be created so that the press of one key will have SIMON run your BASIC program(s) and select the appropriate command file to use. You can even have SIMON pause at any input so that you can enter information that won't be the same each time.

SIMON is perfect for any type of reporting, file maintenance or any other program that requires a sequence of prompts to be answered each time it's used. Included free with PRO-COLOR-FILE.

Requirements: 64K Color Computer with Disk.

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TELEGRAPHICS

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PRINT HI-RES GRAPHICS WHILE USING TELEWRITER-64!

Use your CoCo Max, Graphicom or any other graphics editing program to create your own letter heads or sales charts and then print them while you're using Telewriter-64. It's the perfect way to add that personal touch to your correspondence.

Telegraphics interfaces with Radio Shack, Epson, Gemini, C-Itoh and Okidata printers having dot-addressable graphics. A simple modification to Telewriter-64 will allow you to exit Telewriter via the DISK I/O MENU and print out the graphic without affecting any of your text in the buffer.

This is the same feature that is included in our MASTER DESIGN program. Since we felt you don't need to buy two graphics editing programs, we have made this feature available at a reduced price.

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Telewriter-64 + TELEGRAPHICS - $64.95
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ALL 3 PROGRAMS - $129.90
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```
5 PMODE4,1:PCLS:SCREEN1,1
6 FORW=1TO150:PSET(RND(252),RND(
191)):NEXTW:FORW=1TO10:CIRCLE(RN
D(255),RND(191)),RND(2):NEXTW
10 IFB=0 THEN X=X+3
11 IFB=1 THEN X=X-3
12 IFBB=0 THEN XX=XX+3
13 IFBB=1 THENXX=XX-3
14 G=G+GG
20 Y=G+10*(SIN(X))
30 LINE(X,Y)-(Y,XX),PSET
31 CIRCLE(X,Y),R:CIRCLE(Y,XX),R
32 IFX=255 THENB=1
33 IFX=0 THEN B=0
34 IFXX=192 THEN BB=1:GOSUB100:P
CLS:R=RND(10):FORW=1TO150:PSET(R
ND(255),RND(191)):NEXTW:FORW=1TO
10:CIRCLE(RND(255),RND(191)),RND
(2):NEXTW
36 IFXX=0 THEN BB=0
37 IFG=248 THEN GG=-2
38 IFG=10 THEN GG=2
50 GOTO10
100 PLAY"V1"
101 J=RND(5):J$="O"+STR$(J):PLAY
J$
110 FORJ=1TO15
120 PLAY"T255V+ABGABG":NEXTJ
130 FORJ=1TO15
140 PLAY"T255V-ABCDEFGABCDEFG":N
EXTJ
150 FORJ=1TO460:NEXTJ
160 J=RND(4):ONJ GOSUB 200,250,3
00,350
161 RETURN
200 FORJY=0TO191:LINE(0,JY)-(255
,JY),PRESET:NEXTJY:RETURN
250 FORJY=191TO0STEP-1:LINE(0,JY
)-(255,JY),PRESET:NEXTJY:RETURN
300 FORJX=0TO255:LINE(JX,0)-(JX,
191),PRESET:NEXTJX:RETURN
350 FORJX=255TO0STEP-1:LINE(JX,0
)-(JX,191),PRESET:NEXTJX:RETURN
```

Speed Optimizing

By Doug Farrell

Ball presents a stunning, visual graphics effect. Before loading and running *Ball*, enter the following pokes:

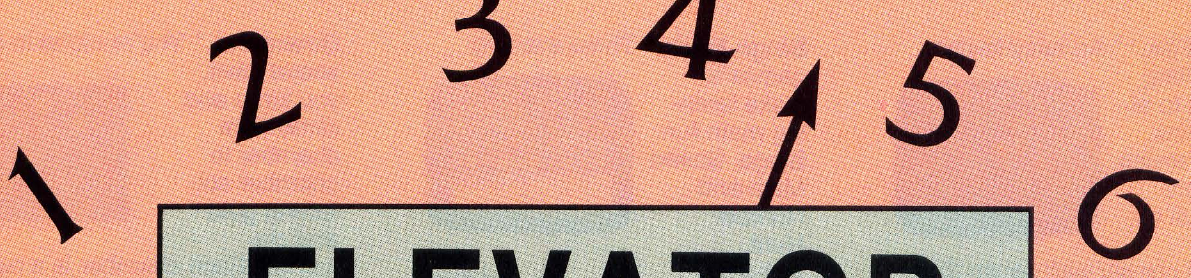
```
POKE 28160,0:POKE25,110:NEW
```

32K ECB

The listing: BALL

```
10 CLS6:PRINT@224,"CAN THE COMPU
TER WORK AT HIGH   SPEED?      (Y
/N)"
20 A$=INKEY$:IFA$="Y"THENPOKE654
95,0:WA=40:GOTO30ELSEIFA$="N"THE
NPOKE65494,0:WA=20:GOTO30:ELSEIF
A$=""THEN20ELSEGOTO20
30 IN=1:S=1.33333333
40 R=-.390625:Z=400:Z1=3600
50 CLS4:PRINT@224,STRING$(32,32)
;
60 PRINT@192,STRING$(32,153);
70 PRINT@256,STRING$(32,153);
80 A$=" 1YOU WON'T BELIEVE THIS!
!! 3PRETTY INCREDIBLE I MIGHT AD
D 5OK, OK, I'M WORKING ON IT!!!
7ALLRIGHT, GET READY, HERE IT IS
 9"
90 FORP=1TO13STEP4
100 PMODE3,P:PCLS3:COLOR1,1
110 M1=INSTR(A$,STR$(IN))+2
120 PRINT@224,MID$(A$,M1,INSTR(M
1,A$,STR$(IN+2))-M1)
130 FORL=0TO256STEP64:LINE(L,191
)-(128,96),PSET:NEXT
140 FORL=112TO189STEP8
150 L1=L+IN:L2=L1-96:I2=IN/40:L2
=L1-96
170 LINE(257-L1*S,L1)-(L1*S,L1),
PSET:LINE(257-L1*S,L1)-(257-L1*S
,L1-26+L2*R),PSET:LINE-(0,L1-26+
L2*R),PSET:LINE(L1*S,L1)-(L1*S,L
1-26+L2*R),PSET:LINE-(255,L1-26+
L2*R),PSET
180 NEXT
190 COLOR1,1
200 LINE(0,80)-(255,80),PSET
210 PMODE0,P:PCLS0:PMODE3,P:PAIN
T(10,78),1,1
220 COLOR1,1
230 LINE(0,127)-(128,70),PSET:LI
NE-(255,127),PSET:LINE(0,80)-(25
5,80),PSET
240 FORX=58TO178STEP4
250 Y=SQR(Z*(1-(X-118)^2/Z1))
260 LINE(X-2,159-Y)-(X-2,159+Y),
PSET
270 NEXT
280 CIRCLE(128,96),60,2:PAINT(12
8,38),2,2:CIRCLE(128,96),60,1
290 FORA=.2TO1STEP.2
300 CIRCLE(128,96),60,1,A-I2,0,.
53
310 NEXT
320 FORA=0TO.8STEP.2
330 CIRCLE(128,96),60,1,A+I2,.5,
1
340 NEXTA
350 IN=IN+2
360 NEXTP
370 P=1
380 PMODE4,P:SCREEN1,1
390 FORW=0TO WA:NEXT
400 P=P+4:IFP>13THENP=1
410 GOTO380
```

This program helps make the 'ups and downs' of learning easy



ELEVATOR

By Bill Bernico

Sesame Street teaches fundamentals to youngsters, helping them understand simple, everyday words like large or small, near or far, alike or different. Here's a program that helps them comprehend up and down.

This program, *Elevator*, at first glance, may appear to be strictly for young kids. Don't believe it! There are some pretty slick programming tricks integrated into this one — tricks you may want to use in your own programs even if you aren't overly entertained by an elevator making the rounds.

Constructing the seven floors of the building is done in lines 80-220, the building being topped off by the word "ELEVATOR" in Line 230. Lines 240-250 ask if the user wants to go up or down. Lines 260-290 accept user input. Line 270 keeps the words "GOING UP" on the screen and erases the "OR." Line 280 keeps the word "GOING" on the first line, erasing the rest of that line. It also keeps the word "DOWN" on the second line, erasing "(U/D)."

(Bill Bernico is a self-taught computerist who enjoys golf, music and programming. He is a drummer with a rock band and lives in Sheboygan, Wis.)

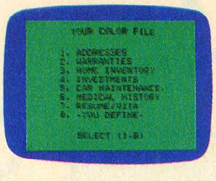
The basis of the elevator action is held in lines 300 through 420. Lines 300-350 are `GOSUB`ed if the user chooses 'D' and lines 360-420 are `GOSUB`ed if the user chooses 'U'.

In either case, 'S' equals the value of the sound, with the top floor having the highest sound. 'N' equals the number of the floor displayed in the right window and is poked into value 'V'. I used `POKE` instead of `PRINT @` because `PRINT @` left unwanted spaces before and after the number.

As the elevator passes each floor a character string that's half black and half yellow appears in the window, which gives the impression of the elevator being halfway

Radio Shack Has Software

Color File.** An easy-to-use home filing system to alphabetize, select, revise and store personal records.



```
YOUR COLOR FILE

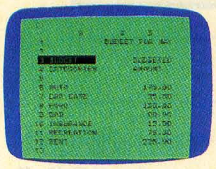
1. ADDRESSES
2. WARRANTIES
3. HOME INVENTORY
4. INVESTMENTS
5. CAR MAINTENANCE.
6. MEDICAL HISTORY
7. RESUME/VITA
8. -YOU DEFINE-

SELECT (1-8)
```

Comes pre-set with seven files—or create your own. #26-3103

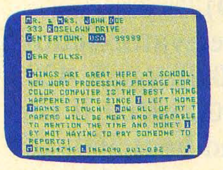
19^{95}

Spectaculator®. Do planning and budgeting with this electronic spreadsheet. Just enter numbers and formulas—results are displayed on command. Ideal for financial forecasting. #26-3104



29^{95}

Color SCRIPSIT®. A powerful home word processing system for correction-free letters. Text can be saved on optional cassette recorder or printed with optional printer. #26-3105



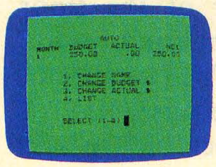
```
MR. & MRS. JOHN DOE
333 ROSELAWN DRIVE
CENTERTOWN, USA  99999

DEAR FOLKS,

THINGS ARE GREAT HERE AT SCHOOL.
NEW WORD PROCESSING PACKAGE FOR
COLOR COMPUTER IS THE BEST THING
HAPPENED TO ME SINCE I LEFT HOME
THANKS SO MUCH!  NOW ALL OF MY T
PAPERS WILL BE NEAT AND READABLE
TO MENTION THE TIME AND MONEY I
BY NOT HAVING TO PAY SOMEONE TO
REPORTS!
MEM=14746 LINE=040 001-032
```

29^{95}

Personal Finance II. Includes 26 expense categories, including auto, gas, food and more. Review spending on year-to-date or category basis. #26-3106



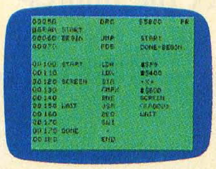
```
            AUTO
MONTH  BUDGET   ACTUAL      NET
1      250.00      .00   250.00

     1. CHANGE NAME
     2. CHANGE BUDGET $
     3. CHANGE ACTUAL $
     4. LIST

     SELECT (1-4)
```

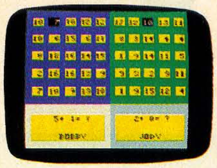
29^{95}

Color Editor/Assembler. Develop 6809 software. You get trial assembly in memory, an editor to change your program and Z-Bug for testing. #26-3250



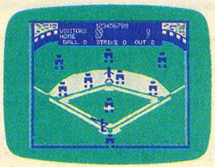
39^{95}

Bingo Math.* Three exciting games to make learning math fun. Bingo, Speed Math and Number Hunt. #26-3150



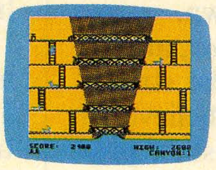
19^{95}

Baseball.* This exciting game plays like the big leagues! You are the coach—it's up to you to control the pitching, defense, and running for extra excitement. Fast paced baseball action. #26-3095



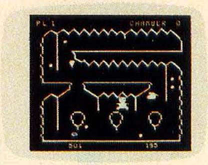
19^{95}

Canyon Climber.* Your climbing skills are tested when you find kicking goats, falling rocks, zinging arrows and more on your way to the summit. #26-3089



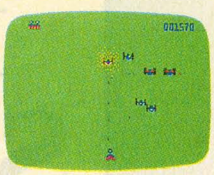
29^{95}

Downland.* You're alone in a secret cave, you jump and climb from chamber to chamber collecting gold and diamonds. Each chamber is a new danger. Will you survive? #26-3046



19^{95}

Galactic Attack.* Enemy spaceships bomb your defense shields. If you destroy this squadron, the enemy reverts to a deadly night attack. #26-3066



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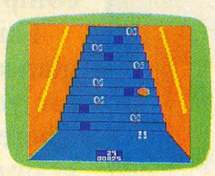
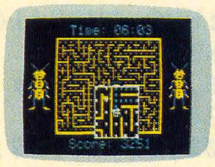
Poltergeist. Based on the hit movie. Search for clues and face the poltergeist. Not for parents or others easily frightened. #26-3073



24^{95}

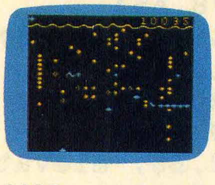
* Joysticks required.
** Cassette recorder required.
*** Joysticks and recorder required.

the Color Computer You Want



Mega-Bug.* A maze of fun! Try to lose the little "buggers" hot on your trail. You can't stop. Everywhere you go, on every turn, there's more of them! Excellent color graphics. #26-3076

19^{95}

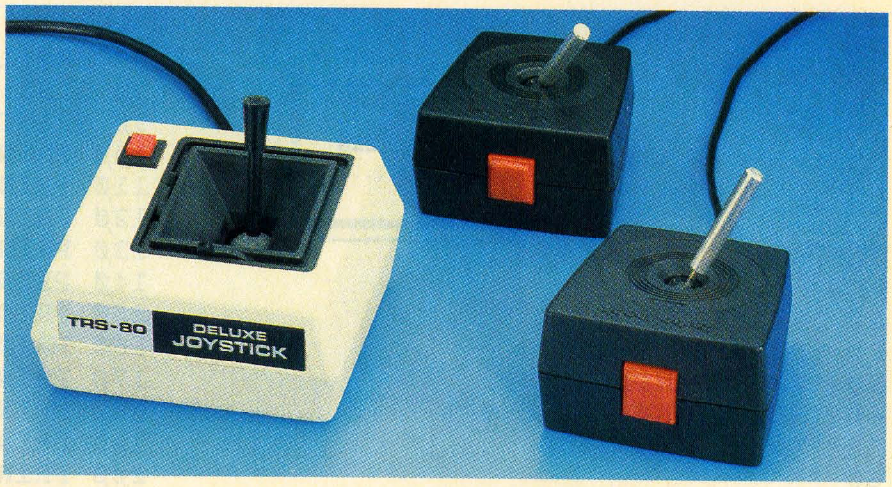


Slay the Nerius.* Fast action is needed to save your submarines from deadly starfish and the ancient sea creature—Nerius. #26-3086

19^{95}

Clowns and Balloons.* A real circus act. Use your safety net to bounce the clown up and down to pop the balloons overhead! Be careful—don't let the clown fall. #26-3087

19^{95}

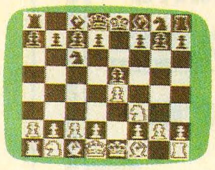


Deluxe Joystick. Get accurate cursor control and quicker response. Dual-axis trim controls. #26-3012

29^{95}

Joysticks. Two controls with full 360° movement! Single-shot button. A "must" for selected games. #26-3008 (pair)

19^{95}



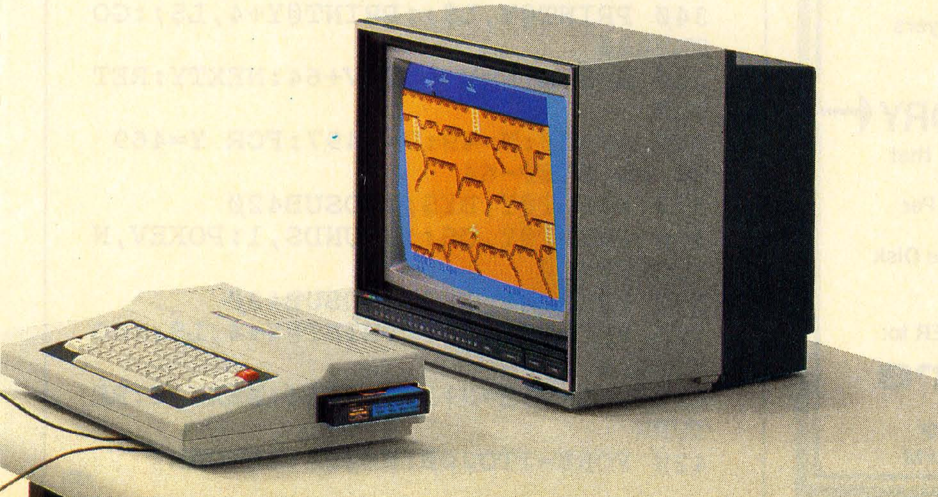
Cyrus. A chess program with beginner to tournament skill levels. You can take back a move or reject the computer's move and force it to play again.

19^{95}

7 CARD STUD LIMIT RAISE
997 JOE
HAL 997
4
1002 SID
YOU 996

7 Card Stud. Compete with three computer poker players. They can adjust to your playing style and make it more difficult to win. #26-3000

19^{95}



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between floors. I chose the variable BY$ to represent the "Bottom Yellow" color block. TY$ is used when the "Top Yellow" block appears.

These actions are merely repeated in a FOR/NEXT loop until you've covered all seven floors. I'd be interested in hearing from anyone who can use this premise and build a more complex program around it. My address is 708 Michigan Avenue, Sheboygan, WI 53081, phone (414) 459-7350. □

250 225
END 2

The listing: ELEVATOR

```
10 'ELEVATOR
20 'BY BILL BERNICO
30 '708 MICHIGAN AVE.
40 'SHEBOYGAN, WI 53081
50 '(414) 459-7350
60 '
70 L$=CHR$(128):A$=STRING$(10,19
1):B$=CHR$(191):C$=B$+B$+B$+L$:D
$=CHR$(159):E$=STRING$(2,191):TY
$=CHR$(156):BY$=CHR$(147)
80 CLS3:PRINT@498,A$;
90 PRINT@466,C$;C$;E$;
100 PRINT@434,A$;
110 PRINT@402,C$;C$;E$;
120 PRINT@370,A$;
130 PRINT@338,C$;C$;E$;
140 PRINT@306,A$;
150 PRINT@274,C$;C$;E$;
160 PRINT@242,A$;
170 PRINT@210,C$;C$E$;
180 PRINT@178,A$;
190 PRINT@146,C$;C$;E$;
200 PRINT@114,A$;
210 PRINT@82,C$;C$;E$;
220 PRINT@50,A$;
230 PRINT@18,B$;"elevator";B$;
240 PRINT@0,"GOING UP OR";
250 PRINT@32,"DOWN (U/D)?";
260 I$=INKEY$:IFI$=""THEN260
270 IF I$="U"THEN PRINT@8,"    ";
:PRINT@32,STRING$(11,143);:GOSUB
 360
280 IF I$="D"THEN PRINT@6,"
";:PRINT@37,"      ";:GOSUB 30
0
290 GOTO 80
300 S=180:N=55:V=1113:FOR Y=85 T
O 469 STEP 64
310 PRINT@Y,TY$;:GOSUB420
320 PRINT@Y,D$;:SOUNDS,1:POKEV,N
:GOSUB420
330 PRINT@Y,BY$;:GOSUB420
340 PRINT@Y,L$;:PRINT@Y+4,L$;:GO
SUB420
350 S=S-5:N=N-1:V=V+64:NEXTY:RET
URN
360 S=150:N=49:V=1497:FOR Y=469
TO 85 STEP-64
370 PRINT@Y,BY$;:GOSUB420
380 PRINT@Y,D$;:SOUNDS,1:POKEV,N
:GOSUB420
390 PRINT@Y,TY$;:GOSUB420
400 PRINT@Y,L$;:PRINT@Y+4,L$;:GO
SUB420
410 S=S+5:N=N+1:V=V-64:NEXT Y:RE
TURN
420 FORK=1TO200:NEXTK:RETURN
```

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Uncomplicate Programming Tasks Using Your ROM Routines

By R. Bartly Betts
Rainbow Contributing Editor

I recall a saying I used to hear. The situation went like this:

If I wanted to borrow my friend's yoyo, I said, "Hey, Bryan, can I borrow your yoyo?"

He kindly replied, "Ah, go get your own, dummy."

I said, "Why buy a cow when you can milk one through the fence?"

He promptly hit me on the jawbone with his yoyo.

You Bought it with Your Computer

Well, there are a few things you can borrow from your computer, without endangering your jawbone. They are called ROM routines. Remember? I mentioned them in the August column.

A ROM routine is a machine language routine that resides in ROM. Actually, your computer's ROM (Read-Only Memory) is nothing but a series of machine language routines and tables. Some of the routines only operate as part of the BASIC ROM built into your computer, but other routines can be called from any program and put to use.

THE RAINBOW has carried numerous articles and listings dealing with ROM routines and I do not propose to compete with them. However, I have talked to a number of people who, after looking over the articles, still didn't know of what value they are or how to put them to use.

Along with ROM routines, your computer also contains some tables and values in a "work space" area of RAM that can also be borrowed and manipulated to make assembly language programming a bit easier. I will leave that discussion for the future.

Are ROM Routines Worthwhile?

Before encouraging you about ROM routines, I should mention that using them is not always the best policy. You may have experienced the frustration of having a program that works on one version of the Color Computer, but does not work properly on another version.

Often this is due to a change made in the ROM routines that the program attempts to directly access. Tandy, of course, does not guarantee it will leave ROM routines alone in new versions of BASIC. Thus, using them can create future problems for you or someone else.

A good example of this type of problem is found by attempting to use the *Telewriter* word processor with the JDOS disk controller. The JDOS controller contains its own Disk BASIC routines, and *Telewriter* relies heavily on using built-in Disk BASIC. It does not find what it is looking for in JDOS and, as a result, cannot function. A machine language program that is totally independent of ROM does not have this type of problem and could possibly operate on a totally different 6809-based computer.

Despite the problems involved in using ROM routines, it is still a fun way to program. There is something exciting about doing a complicated task with very little programming. For instance, there is a ROM routine available to clear the text screen and home the cursor. To use it, you need only one program line:

```
JSR   $A928
```

That's all. Routine $A928 clears the screen and sends the cursor to the top left-hand corner of the screen. If you

---

(R. Bartly Betts is currently a technical writer for Tandy Corp. and is a former news reporter and magazine editor. As the father of 10 children, computers are his escape from reality.)

wish to check this out from BASIC, type `EXEC &HA928` and ENTER. It is more work than typing `CLS` and pressing ENTER, but it does the job. From assembly language, however, such a routine is much less work than writing the code to do the job. For instance, the code to only clear the screen might look something like this:

```
        LDA     96
        LDX     $#400
LOOP    STA     ,X+
        CMPX    $#600
        BEQ     DONE
        BRA     LOOP
```

Anytime six lines of code can be replaced with one it seems like a good process. However, the one-line program would never work in a 64K machine with BASIC ROM disabled. The six-line program possibly could.

If you like the idea of this kind of programming, I have included a few more routine addresses. Experiment with them. If you get some good results and find some good applications, let me know and I will share them with other readers.

Address	Purpose
$A30A	Print the character represented by the value in Register A to the screen.
$A393	Input a line of text from the keyboard and store it in a buffer at memory location $02DD.
$A027	Reset your computer.
$A2BF	Send the character represented by the value in Register A to the printer.
$A027	Initialize BASIC.
$A9DE	Sample the joysticks and store the values in the following locations: $015A - up/down value of left joystick; $015B - left/right value of left joystick; $015C - up/down value of right joystick; $015D - left/right value of right joystick.
$BDCC	Display the decimal value of Register D.

There are, of course, many other ROM routines. If there are some you especially like, send me a note and I will also share them with other readers.

The Son of *Bytecoder*

I was pleasantly surprised at the interest in the *Bytecoder* program of some months back. If you remember, it is a BASIC program designed to allow you to examine and change memory locations. Its purpose is to let you enter a machine language program without the use of an editor/assembler. One of its features is the ability to save the machine language program once you have typed it.

I have gotten a lot of letters and calls as a result of the program. Some wanted to say they enjoyed the program and found it useful (thank you very much), and others were having problems. Also, a couple of readers offered help and suggestions.

To Richard D. King of Houston, Texas, and Larry Geiger of Lawrence, Kan., I give thanks. Your suggestions and upgrades are appreciated and are included in my new version. For those who wanted some way to examine registers in BASIC, I have included the feature in the new version of *Bytecoder*. The interest in *Bytecoder* seemed keen enough that I decided to upgrade it and include all of your ideas and suggestions, your corrections and a few other goodies.

What it Does

Bytecoder now has three displays on the screen when you are entering or examining code. Instead of just the hexadecimal values of the memory locations being displayed, you also see the decimal values and the ASCII characters these values represent. If an ASCII value cannot be displayed on the screen (it is less than 32) then the display shows "XX."

I have included the decimal display for those who are still not familiar with hexadecimal. I have retained the requirement that the values you enter are in hexadecimal due to the fact that this is what most assembly language listings show.

I have included the ASCII characters to allow you to read any text located in memory.

Thanks to Mr. King, *Bytecoder* now adds an extension to the filename if you are using disk. It also provides a prompt that asks if you wish to save the program to tape or disk and then acts accordingly. As well, Mr. King included some lines to trap filenames that are too long or if you try to save a file without a filename.

Mr. Geiger provided the solution to the problem of wrong values being displayed if a number less than 16 is entered. The change is in Line 630 for those who have been trying to track it down yourselves.

As mentioned earlier, *Bytecoder* now lets you examine the registers from BASIC. The process is accomplished through a machine language program, but it is accessed by BASIC, so you need not leave the program to use the function.

Other changes are mostly cosmetic and have little bearing on how the program works. The new lines have been inserted between the old lines so you will have little difficulty in spotting them to add to the original program.

Putting it to Use

To use *Bytecoder*, after you have typed it in or loaded it from RAINBOW ON TAPE, type `RUN` and answer the starting address prompt with the hexadecimal address of where you wish to examine or change memory. The screen displays the contents' 24 bytes, beginning at the address you specify, in Hex, decimal and ASCII. A cursor appears over the first value. To change that value, type it in Hex. When you do, the screen display changes to show the new value.

If you do not wish to change the value, use the right- and left-arrow keys to move the cursor one byte at a time. To move the cursor eight bytes at a time (to the next row above or below), use the up- and down-arrow keys. Use the equals sign (=) or minus sign (-) key to move the display back 24 bytes, or the plus sign (+) or semi-colon (;) key to move the display ahead 24 bytes.

As you move through memory, the current memory location indicated by the cursor is displayed on the left upper corner of the screen. If you press 'R' to display the registers, they appear on the upper right of the screen in this order:

Register A
Register B
Register X
Register Y
Register U
Condition Code register

To select a new starting address for the memory display, press 'N'.

To save a block of memory into a file (a machine language program), press CLEAR and answer the prompts.

I have used the speed-up poke to make the display change faster. It is disabled when you save to tape or disk. If you do not wish to use the speed-up poke, or if your machine doesn't like it, edit Line 100. The program runs quite satisfactorily without it.

I have tried to keep *Bytecoder* simple to use but gave it the features it needs. I have included the complete code in Listing 1 because of the extensive changes that have been made.

As well, the assembly source code for the register display function is included as Listing 2. You may wish to put it to use in other programs. All that Listing 2 does is store the register values in memory locations $7FF8 through $7FFF. I then used `PEEK` to obtain the values, put them in a string and display them (see program lines 840 through 950). You must use `CLEAR 1,&H7FE0` to protect the program and its values if you use it with a BASIC program.

(You may contact Mr. Betts with questions or suggestions at 2251 Lipscomb, Fort Worth, TX 76110, 817-924-3725. Please include an SASE when writing.) ☐

110	65
305	34
440	102
590	41
740	23
836	24
END	32

Listing 1: BYTECODR

```
1 '*************************
2 '*   BYTEMASTER CODER     *
3 '*  BY R. BARTLY BETTS    *
4 '*     3351 LIPSCOMB      *
5 '*  FORT WORTH,   TEXAS   *
6 '*          76110         *
7 '*************************
8 'USE THIS PROGRAM TO INPUT
9 'MACHINE LANGUAGE CODE INTO
10 'MEMORY. USE THESE KEYS:
11 '<N>=GET NEW START ADDRESS
12 'RIGHT ARROW=AHEAD 1 BYTE
13 'LEFT ARROW=BACK 1 BYTE
14 'UP ARROW=BACK 8 BYTES
15 'DOWN ARROW=AHEAD 8 BYTES
16 '<-> OR <=> = BACK 24 BYTES
17 '<+> OR <;> = AHEAD 24 BYTES
18 '<CLEAR> = PREPARE TO SAVE
19 'THE NUMBER KEYS AND THE
20 'ALPHABET CHARACTERS A - F
21 'CAUSE A VALUE BO BE PUT
22 'INTO MEMORY
23 '
24 '
25 '
100 CLS:CLEAR300,&H7FE0
105 GOSUB 950
110 V=32
120 DIM M(24)
130 A$(1)="BYTEMASTER CODER"
140 A$(2)="R.BARTLY BETTS"
150 A$(3)="JANUARY 1985"
155 '       SET UP SCREEN
156 '       GET ADDRESS
160 FOR T=1 TO 3
170 PRINT TAB(16-LEN(A$(T))/2) A
$(T)
180 NEXT
190 GOSUB 790
200 PRINT@V*12," START ADDRESS I
N HEX";
210 INPUT BG$
212 PRINT@V*12,STRING$(32,32)
220 B=VAL("&H"+BG$)
230 BB=B
240 FOR T=0 TO 23
250 BB$=HEX$(PEEK(BB)):IF LEN(BB
$)<2 THEN BB$="0"+BB$
252 PRINT@M(T),BB$;
253 D=D+1:PRINT@M(T)+128-2+D,PEE
K(BB);:IF D>7 THEN D=0
254 CR=PEEK(BB):IF CR>31 THEN PR
INT@M(T)+256,CHR$(CR) ELSE PRINT
@M(T)+256,"XX
260 BB=BB+1
270 NEXT T
272 D=0
290 A$=CHR$(128):B$=CHR$(32)
300 P=0
305 '      KEYBOARD INPUT
306 '      TO EXAMINE AND CHANGE
310 IF P>23 THEN P=0:B=B+24:GOTO
 230
320 IF P<0 THEN P=0:B=B-24:GOTO
230
322 IF D>7 THEN D=0
330 M=M(P): C=PEEK(M+1024):H$=""
340 PRINT@96, "*"HEX$(B+P)"*";
350 IF C>63 THEN G=C-64 ELSE G=C
+64
355 '       WAIT FOR KEYPRESS
356 '       AND PRODUCE CURSOR
360 K$=INKEY$:POKE M+1024,G: IF
K$="" GOTO 360
370 POKE M+1024,C
375 '       LOOK FOR VALID
376 '       KEYPRESS
380 IF K$=CHR$(94) THEN P=P-8:GO
TO 310
390 IF K$=CHR$(10) THEN P=P+8:GO
TO 310
400 IF K$=CHR$(8) THEN P=P-1:D=D
-1:GOTO 310
410 IF K$=CHR$(9) THEN P=P+1:D=D
```

```
+1:GOTO 310
420 IF K$=CHR$(12) THEN 660
430 IF K$="+" OR K$=";" THEN B=B
+P+24:GOTO 230
440 IF K$="-" OR K$="=" THEN B=B
+P-24:GOTO 230
450 IF K$="N" THEN RUN
452 IF K$="R" THEN GOTO 840
455 '     LOOK FOR INVALID
456 '     KEYPRESS
460 IF ASC(K$)<48 OR ASC(K$)>70
THEN 360
470 IF ASC(K$)>57 AND ASC(K$)<65
 THEN 360
475 '     INCREMENT MEMORY
476 '      IF END OF DISPLAY
480 IF P<0 THEN B=B-24:P=1:GOTO
230
490 IF P>24 THEN B=B+24:P=1:GOTO
 230
495 '     PRINT TO SCREEN
496 '     AND GO TO NEXT CHAR
500 PRINT@M,K$;
510 H$=H$+K$
520 M=M+1
525 '     ROUTINE FOR SECOND
526 '     CHARACTER INPUT
530 C=PEEK(M+1024)
540 IF C>63 THEN G=C-64 ELSE G=C
+64
550 POKE M+1024,G
560 K$=INKEY$:IF K$="" THEN 560
570 IF ASC(K$)<48 OR ASC(K$)>70
THEN 560
580 IF ASC(K$)>57 AND ASC(K$)<65
 THEN 560
590 POKE M+1024,ASC(K$)+64
595 '     ADD UP INPUT VALUES
596 '     AND POKE IN MEMORY
600 H$=H$+K$
610 PK=VAL("&H"+H$)
620 POKE B+P,PK
630 IF PK<16 THEN PRINT@M,HEX$(P
K); ELSE PRINT@M-1,HEX$(PK);
632 D=D+1:PRINT@M+D-3+128,PK;:IF
 D>7 THEN D=0
634 PRINT@M+256-1,CHR$(PK)" ";
640 P=P+1
650 GOTO 310
655 '     SAVE PROGRAM TO TAPE
656 '     OR DISK ROUTINE
660 CLS
670 A$(1)="BYTEMASTER CODER"
680 A$(2)="==================="
685 A$(3)="SAVE  PROGRAM"
686 POKE 65494,0
690 FOR T=1 TO 3
700 PRINT TAB(16-LEN(A$(T))/2) A
$(T)
710 NEXT T
720 PRINT@V*4+2,"* START (HEX)..
.";:INPUT BM$:BM=VAL("&H"+BM$)
730 PRINT@V*5+2,"* END   (HEX)..
.";:INPUT EM$:EM=VAL("&H"+EM$)
740 PRINT@V*6+2,"* EXEC    (HEX).
..";:INPUT EA$:EA=VAL("&H"+EA$)
750 PRINT "NAME OF PROGRAM...";:
INPUT NP$
751 IF LEN(NP$)<1 OR LEN(NP$)>8
THEN 750
752 PRINT:PRINT"TAPE OR DISK (T/
D)?"
753 K$=INKEY$:IF K$="" THEN 753
754 IF K$="D" THEN 760 ELSE IF K
$="T" THEN 770 ELSE 753
```

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```
760 NP$=NP$+"/BIN":SAVEM NP$,BM,
EM,EA
765 GOTO 780
770 CSAVEM NP$,BM,EM,EA
780 CLS
781 PRINT "ANY MORE PROGRAM TO B
E INPUT    (Y/N)?"
782 K$=INKEY$: IF K$="" THEN 782
783 IF K$="N" THEN 787 ELSE IF K
$<>"Y" THEN 782
784 RUN 100
787 END
788 '     DATA FOR POSITION
789 '     OF SCREEN DISPLAY
790 FOR X=160 TO 224 STEP 32
800 FOR T=0 TO 21 STEP 3
810 M(X/4-40+T/3)=X+T-32
820 NEXT T,X
830 RETURN
835 '     PROGRAM TO
836 '     READ REGISTERS
840 DEFUSR1=&H7FE0
850 A=USR1(0)
860 R(1)=PEEK(&H7FF8):R$(1)="a"
870 R(2)=PEEK(&H7FF9):R$(2)="b"
880 R(3)=PEEK(&H7FFA):R$(3)="x"
890 R(4)=PEEK(&H7FFD):R$(4)="y"
900 R(5)=PEEK(&H7FFC):R$(5)="u"
910 R(6)=PEEK(&H7FFF):R$(6)="c"
920 CT=0:FOR T=57 TO 236 STEP 32
922 CT=CT+1
930 PRINT@T,R$(CT)"="R(CT);
940 NEXT T:GOTO 360
945 '     DATA FOR REGISTER
946 '     READING PROGRAM
950 FOR T=0 TO 21
960 READ AA
970 POKE &H7FE0+T,AA
980 NEXT
990 RETURN
1000 DATA 183, 127,248,247,127,2
49,191,127,250,255,127,252,16,19
1,127,253,31,168,183,127,255,57
```

Listing 2: Assembly Language Source Code for Register Display Routine

```
7FE0                    00100         ORG     $7FE0
7FE0 B7     7FF8        00110         STA     $7FF8
7FE3 F7     7FF9        00120         STB     $7FF9
7FE6 BF     7FFA        00130         STX     $7FFA
7FE9 10BF   7FFD        00150         STY     $7FFD
7FED 1F     A8          00160         TFR     CC,A
7FEF B7     7FFF        00170         STA     $7FFF
7FF2 39                 00180         RTS
                 0000   00190         END
00000 TOTAL ERRORS
```

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By Bernie Litton

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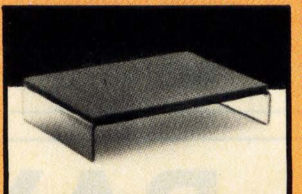

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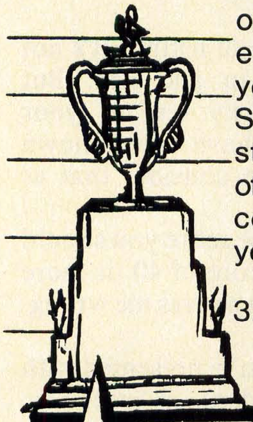
by Steven Hirsch



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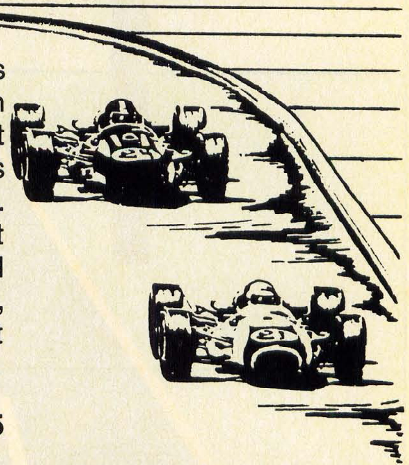
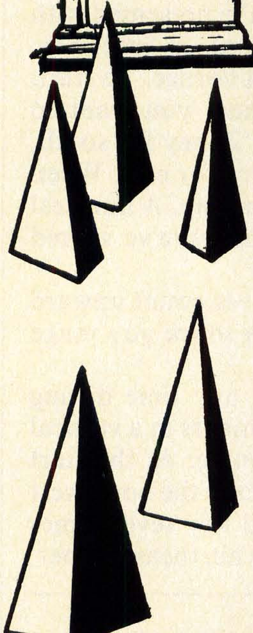
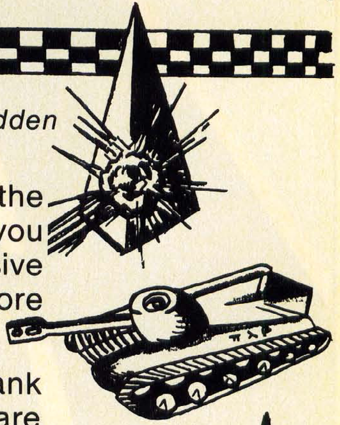


ROMMEL 3-D

By Kary McFadden





You clutch the tank controls, searching for any sign of the enemy. Suddenly a blip appears on radar! Frantically, you move your tank into position. At last you spot the elusive enemy tank! Facing it, you race to lock sights and fire before he does!

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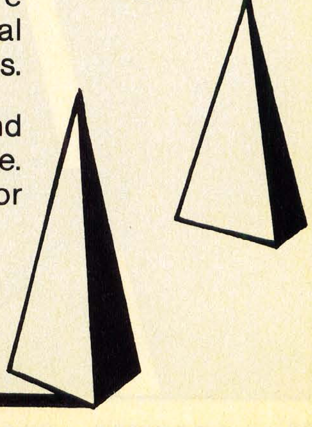

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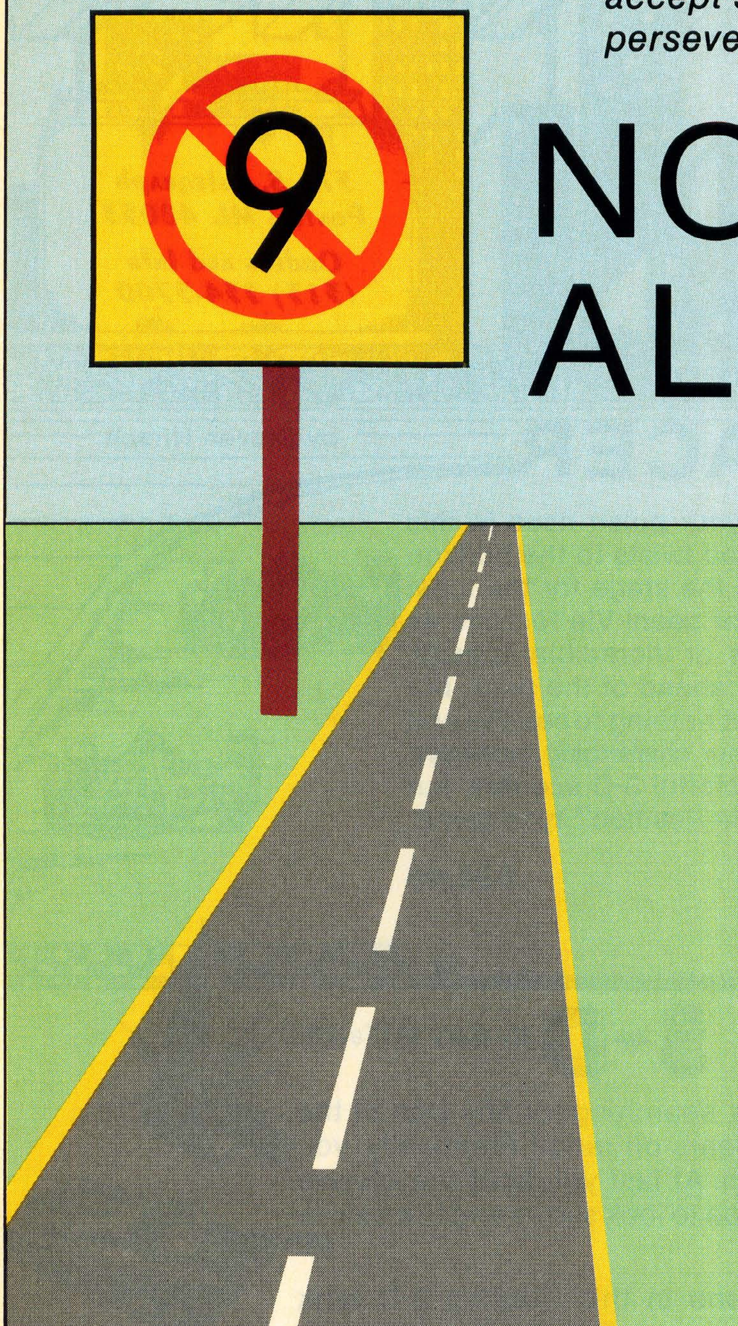

NO NINES ALLOWED!

By Richard Ramella

No-niner is an innocent little listing. It's not much trouble to type in and run. But beyond that, it's a tricky test of your thinking ability. Some players have been known to never beat it. If you want to consider that as a dare, then do.

My best score is 39, so that's the score you should equal or *try* to beat. I think a score of 40 or more is impossible, but I hope someone proves me wrong. (If so, I'd like to hear about it.)

When you run the program you're presented with an eight-by-eight grid comprised of all letter O's, except for the 'X' in the northwest corner. To start, move the 'X' to the position where you want to begin. Tap the 'A' key for north, 'Z' key for south, comma key for west and period key for east. When ready to start the test, press 'P' for play. A numeral '1' appears in place of the 'X' and you've scored one point.

From this start, directional moves count upward to '8', then start over at '1'. Every move you make scores a point.

Of course, there's a catch. At any time during play, the game ends if any two numbers in a vertical row total nine or more. For example: At the start you press 'P' for play when the 'X' is in the northwest corner. Then, pressing the period key seven times counts from '2' to '8', ending at the northeast corner.

(Richard Ramella is a former newspaper editor who now works as a writer for a California hospital. He has published more than 200 Color Computer programs.)

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The only possible next move is south. You press the 'Z' key, a '1' is set beneath the '8' and the game ends because the two cells' numbers total nine.

No-niner keeps score, won't let you move off the playing board or into previously set numbers, and ends the game when you have exceeded the legal vertical total of eight.

In keying in the game, remember the material within quotes in lines 160 and 390-430 is comprised of the letter 'O' and *not* a zero. Similarly, the material within quotes in Line 180 is the uppercase word for "OX" (as in strong as an ox).

This is a game for naturally mellow folks who accept success as the reward for perseverance. Keep the desk pounders away from it; they might smite your CoCo to bits when they score a measly 16 points or so for the 20th time in a row!

(Any questions about *No-niner* may be directed to Mr. Ramella at 1493 Mt. View Avenue, Chico, CA 95926. Please include an SASE.) □

```
330 .......15
END .......0
```

The listing: NONINER

```
100 REM * NO-NINER * TRS-80 EXTE
NDED COLOR BASIC 16K
110 REM * BY RICHARD RAMELLA
120 CLEAR 500
130 DIM A$(10)
140 CLS: PRINT "CAN YOU SCORE 39
?"
150 FOR C=1 TO 10
160 A$(C)="0000000000"
170 NEXT C
180 A$(2)="0X"+RIGHT$(A$(2),8)
190 X=2: Y=2: B$="12345678"
200 GOSUB 550
210 A$=INKEY$
220 IF A$="" THEN 210
230 GOSUB 500: GOSUB 390
240 IF A$="P" THEN MID$(A$(Y),X,
1)="1": GOSUB 550: GOTO 270
250 GOSUB 550
260 GOTO 210
270 Q=1: S=1: C=2
280 A$=INKEY$
290 PRINT @ 360,"SCORE"S;
300 IF A$="" THEN 280
310 GOSUB 500
320 IF INSTR("AZ,.",A$)=0 OR A$=
"" THEN 280
330 GOSUB 390: GOSUB 550
340 U=VAL(MID$(A$(Y-1),X,1))
350 M=VAL(MID$(A$(Y),X,1))
360 P=VAL(MID$(A$(Y+1),X,1))
370 IF U+M>8 OR P+M>8 THEN XX=10
0: GOTO 500
380 GOTO 280
390 IF Q=0 THEN MID$(A$(Y),X,1)=
"0"
400 IF A$="A" AND Y>2 AND MID$(A
$(Y-1),X,1)="0" THEN Y=Y-1: L=1
410 IF A$="Z" AND Y<9 AND MID$(A
$(Y+1),X,1)="0" THEN Y=Y+1: L=1
420 IF A$="," AND X>2 AND MID$(A
$(Y),X-1,1)="0" THEN X=X-1: L=1
430 IF A$="." AND X<9 AND MID$(A
$(Y),X+1,1)="0" THEN X=X+1: L=1
440 IF Q=0 THEN MID$(A$(Y),X,1)=
"X": RETURN
450 IF L=0 THEN 280 ELSE L=0
460 MID$(A$(Y),X,1)=MID$(B$,C,1)
470 S=S+1: C=C+1
480 IF C=9 THEN C=1
490 RETURN
500 IF XX<>100 THEN RETURN
510 PRINT @ 416,"END SCORE:"S
520 FOR T=1 TO 1000
530 NEXT T
540 END
550 GH=76
560 FOR D=2 TO 9
570 PRINT @ GH,MID$(A$(D),2,8);:
 GH=GH+32
580 NEXT D
590 RETURN
600 END
```

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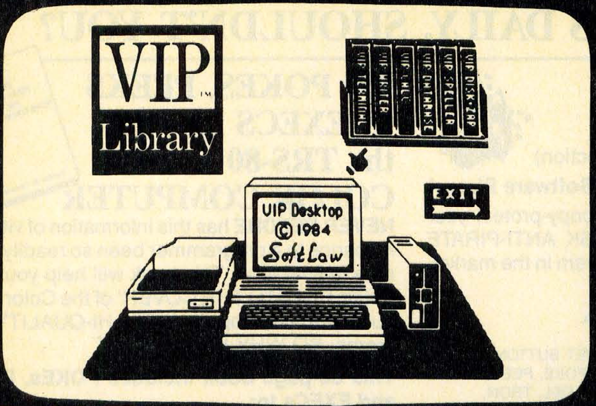

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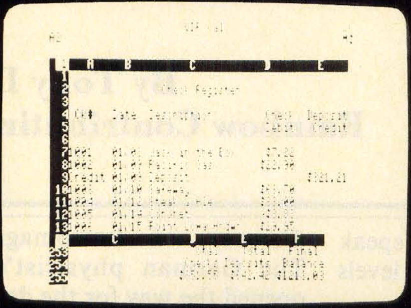

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The Analog-To-Digital Converter, Part 1

By Tony DiStefano
Rainbow Contributing Editor

The world inside your computer consists of zeros and ones — all that goes on inside your computer hinges on two values. Memory, PIAs, CPUs, VDGs and SAM chips all transfer information between each other using only two different states. These states are called *logic states.*

The first logic state is zero, also known as "low" or "lo." In the Color Computer (and most computers) a logic state low is zero volts, also known as *ground* level. The second logic state is one, also known as "high" or "hi." Again, in the Color Computer, a logic state high is five volts. Except for specified tolerances, all other voltages in between are undefined and if encountered can give the computer some unpredictable results. This is the digital universe of computers. Figure 1 shows a typical digital wave form.

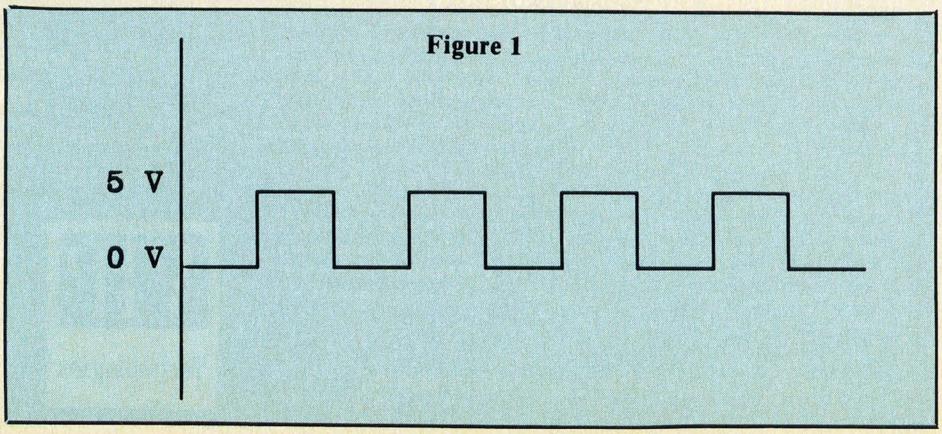
The real world, however, deals in ever changing states. Digital ones and zeros are just two of millions of different states that exist. The real world is an analog world. A good example of the analog world is speech. You can speak loud, you can speak low or many levels in between.

Sound waves are ever changing. For example, if you take a microphone and amplifier and hum into it, the speaker will vibrate, reproducing the sound you are making. That vibration is a back and forth motion. The frequency of the back and forth motion depends on the frequency of your hum. Frequency is measured by how many times a wave form goes back and forth in one second. Every time the speaker moves back and forth is one cycle.

From 1886 to 1888, the work of Heinrich Rudolph Hertz led to his discovery of electromagnetic waves. The German physicist's revelation opened the way for the development of radio, television and radar. As a tribute to him, the frequency of any wave, be it digital or analog, is measured in hertz (or Hz, for short). In the audible range, the frequency is from about 20 Hz to 20,000 Hz or 20 kHz. The 'k' stands for "kilo" meaning thousand. Our CoCos, for instance, run at 894,000 Hz or .9 MHz. The 'M' stands for "mega" meaning million.

Figure 2 shows a graphic representation of the output of a sound wave. Compare it to the wave form in Figure 1. There are some obvious differences;

Figure 1



(Tony DiStefano is well-known as an early specialist in computer hardware projects. He lives in Laval Ouest, Quebec.)

it is these differences that make it impossible for a computer to directly and accurately read and duplicate an analog wave form.

Don't despair, there are ways around it. This is the first of a two-part project on how you can use a computer to measure analog signals. This project stems from several letters received from my readers requesting that I build a computerized oscilloscope adapter for the joystick port. I looked into the joystick port as an input, but found it to be inaccurate or not fast enough. By the time you finish reading this, you'll know why.

Anyway, this month we'll cover the theory on how a computer (and a little hardware) can convert an analog signal to a digital value. Next month we'll cover how to build and calibrate the analog to digital converter.

Now to the task of explaining how a computer can convert an analog signal to a digital value. The first thing the computer needs is some hardware, a comparator. A comparator is an IC that has two inputs (the "positive" input and the "negative" input) and one output. The output has two states; on or off, good for a digital computer. The inputs, however, have analog inputs.

Here is how a comparator works. When the positive input voltage is higher (more voltage) than the negative input, the output is high. When the positive input voltage is lower (less voltage) than the negative input, the output is low. Figure 3 shows a block diagram of a computer-controlled comparator.

The way it works is simple. If we had a known voltage at the negative input, by reading the output (high or low) we could tell if the test voltage at the positive input is higher or lower than our reference voltage. Furthermore, if we change our reference voltage and zero into the unknown voltage, we will then know what the unknown voltage is. This technique is known as successive approximation.

The procedure for successive approximation is as follows: Start by putting half of the maximum voltage your device can measure to the reference voltage. If the output of the comparator is high, that means the unknown voltage is higher than the reference voltage. We then increase the reference voltage by half the difference of the present value and the last value and test again. If the output of the comparator is low, that means the unknown voltage is lower than the reference voltage. We would then decrease the reference voltage by half the difference and test again. Continue to do this until we have reached the unknown voltage.

Figure 2

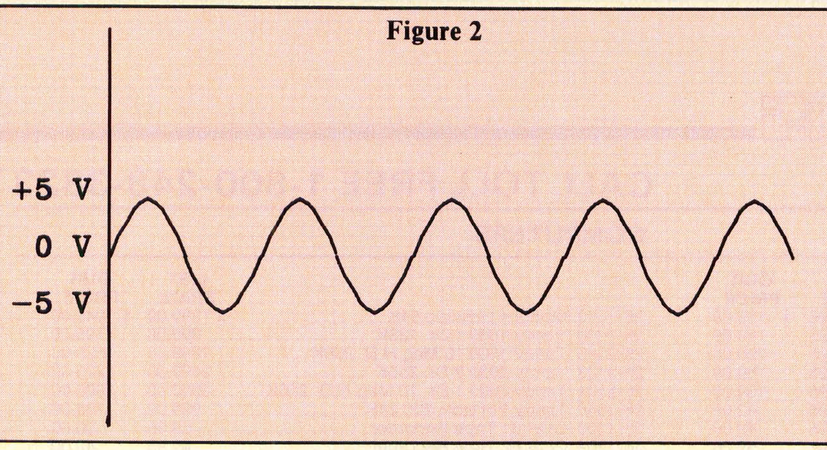
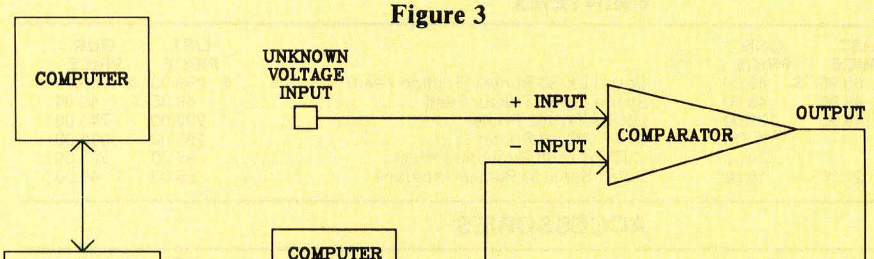


Figure 3



Let's take an example. In this example, I round off the reference voltage to the nearest whole number for ease of calculation. The maximum voltage is 100 and the unknown voltage 47. The first reference value is 50 — too high, so we subtract from the present value using the successive approximation method. New reference is now (100-50)/2 or 50-25; the new reference is 25 — too low, so we add. The new reference is now (50-25)/2 or 25+13; the new reference is 38, still too low. Add again, (25 -38)/2 or 38+7. The new reference is now 45, again too low. Add (38-45)/2 or 45+4 and the new reference is 49. That's too high, so substract (49-45)/2 or 49-3. The new reference is now 46, which is too low, so add (46-49)/2 or 46+2. The new reference voltage is now 48. Too high, so substract (49-48)/2 or 48-1. We have now reached the point where our reference voltage matches the unknown voltage.

Actually, the rounding off is not limited to integer calculation, but rather to the resolution of the reference voltage. When zeroing into the unknown voltage, you divide until the unit change in voltage is one. You cannot divide and get a more accurate fix on the unknown value. No matter how close you get, the comparator will always give a higher or lower value. The more accurate the reference, the closer you get to the real value of the unknown voltage.

This reference accuracy is one of the reasons why I chose not to use the joystick input. You see, inside the Color Computer there is all of the previously mentioned circuitry: a voltage comparator, a variable voltage reference, an unknown voltage input (joystick) and the interfacing circuit to control it all. A more common name for a variable voltage reference is "Digital-to-Analog Converter" or DAC for short. The DAC inside the CoCo is limited. It has a fixed output of .25 to 4.75 volts and the resolution of about 0.0715 volts.

The range is not very good for an analog-to-digital project.

Another reason for not using the joystick input is speed. You see, the successive approximation method talked about earlier is time-consuming. The CPU has to calculate the next reference voltage value, set up the DAC, read the comparator output and make the proper decision.

The speed at which an unknown voltage can be found is very important. When the unknown voltage is stable and not changing, the computer can take all the time in the world to figure out what the voltage is. But, if the unknown voltage is changing, like the humming mentioned earlier, speed is important.

The amount of time it takes the CPU or other device to find an unknown voltage value is called the "conversion time." The faster the conversion time, the more samples can be taken and the more accurate the wave shape reproduction can be. For example, if you have a loop to read the A to D converter which takes 10 ms (ms = milliseconds = 1/1000 seconds), that means you have 100 samples per second. If you are sampling a wave form that is 1,000 Hz, you will miss a lot of information. It is safe to say you need at least 10 times the sample rate to reproduce a particular sine wave with reasonable accuracy.

A BASIC loop using the JOYSTK command will limit you to about 3 Hz — not very fast. In machine language, you can get a lot faster, but it is still slow due to the overhead created by the CPU having to do the conversion. In the case that the CPU has an external A to D converter, a great increase in speed and accuracy can be achieved. With the right software the effective conversion rate for an external A to D could be as high as 800 hertz.

The last thing I must mention this month is that the A to D circuit requires negative voltage. This is no problem with the first CoCos, but it is with the CoCo 2. The CoCo 2 has no negative voltage available at the cartridge connector. There is, however, negative voltage available inside the CoCo 2.

To bring this voltage to the cartridge connector is simple; you just need one piece of wire and a soldering iron. First, unplug the computer, then open it and locate the chip with the number SC77527; this is the SALT chip. You will find -12 volts on pin 15 of this chip (just what the doctor ordered). Solder one end of a piece of wire to that pin. Locate pin #1 of the cartridge connector (it is the top pin closest to the back of the computer) and solder the other end of wire to this pin. Before you plug anything into the computer, measure the voltage to that pin. It should be about -12 volts, give or take two volts.

On the CoCo 2 this pin is normally not connected to anything. On the regular CoCo, this is the regulated -12 volt pin. The -12 volts you just added to that pin are not regulated, but in this and most cases, it will not matter. There will be a negative voltage regulator on the A to D convertor. Of all the peripherals I have seen for the CoCo, only one uses the negative voltage and it doesn't matter that it is not regulated.

If all is well, close your computer and I'll see you next month with Part 2 of the A to D converter.

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16K
ECB

Learning The Art Of Written Expression With Proper Punctuation

By Steve Blyn
Rainbow Contributing Editor

"Holy cow, Batman! Watch out for the Penguin!" exclaimed Robin.

There are quite a few punctuation marks in the preceding paragraph. Using punctuation marks correctly was almost becoming a lost art until recently. The "back to basics" movement occurring in many school systems has included stressing the teaching of written expression. The proper use of punctuation marks is an essential part of this skill.

Punctuation Quiz reviews the uses of punctuation marks. A chart is displayed listing major punctuation marks and shows their keyboard symbols. The student is then quizzed on when to use each of the marks illustrated on the chart. The student's task is to type in the answer to the computer's questions.

Rather than having the student insert the actual mark as the answer, we felt it proper, in this case, to require the correct spelling of names of the punctuation marks. This is always a difficult decision to make when writing any educational program. It presents a double-edged sword: On one hand, we always prefer to teach correct spelling; on the other hand, a child often feels cheated if he knows the correct answer but misspells it and gets marked as wrong.

We compromised on the issue this time. Exact spelling is the only way to get a correct answer in this program. The pressure is eased, however, by omitting any scoring in the program. While we do want the children to learn to spell words correctly, we do not want, at the same time, to penalize them too severely for minor spelling mistakes. After each group of five questions, the student may press 'C' to continue or 'E' to end the program. The program may be played continuously until the student learns all of the marks in the program.

Punctuation Quiz also helps to familiarize children with the keyboard/typewriter symbols. Punctuation marks are often confusing to beginners because the SHIFT key must be used to produce some of them. Fortunately, the CoCo's keyboard is very similar to that of a standard typewriter. More than half of the punctuation marks are in similar positions. Many other computers have keyboards that are quite different from a standard typewriter keyboard.

Beginners should be encouraged to gain familiarity with using all of the CoCo's keyboard symbols. The only odd punctuation marks we have are the brackets. The left bracket is made by simultaneously pressing the SHIFT and down-arrow keys and the right bracket is made by pressing the SHIFT and right-arrow keys. (I have trouble remembering this myself and always have to check it out first.)

Line 50 reads the DATA statements necessary for the chart. Line 60 reads the DATA statements for the questions and answers. Lines 70-100 print out the chart of quotation marks and their symbols.

Lines 190-320 contain the quiz. Line 210 randomly selects one of the 11 possible question and answer sets. Line 220 prints the chosen question. Lines 260-270 check to see whether the answer is correct. If it is incorrect, the correct answer will be displayed.

After five questions, the student may begin again or end the program by pressing either the letter 'C' or 'E'. The

---

(Steve Blyn teaches both exceptional and gifted children, holds two master's degrees and has won awards for the design of programs to aid the handicapped. He and his wife, Cheryl, own Computer Island.)

routine on lines 320-340 takes care of this task. A record of the student's score could be added between lines 320-330 if you desire one. This can easily be achieved by incrementing a counter on Line 260. To achieve this, add `CR=CR+1` at the end of Line 260.

Each time a question is answered correctly, the counter will increase by one. You could then create a line such as `325 PRINT CR:CR=0`. This would indicate the score and reset the count to zero for the next round.

As discussed earlier, we did not feel the need for a scorecard in this particular program. The choice, of course, is yours. As always, please feel free to alter this program as you see fit to help your children and students benefit the most from it.

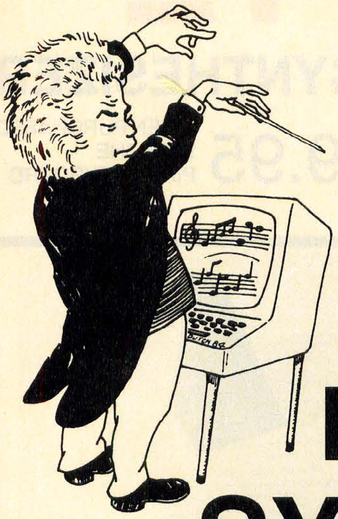
(You may contact Mr. Blyn with any questions about *Punctuation Quiz* at 227 Hampton Green, Staten Island, NY 10312. Please include an SASE.) □

180 194
380 48
END 93

The listing: PUNCQUIZ

```
10 REM"PUNCTUATION QUIZ"
20 REM"STEVE BLYN,COMPUTER ISLAN
D,NY,1985
30 DIM A$(11),B$(11),C$(11),D$(1
1)
40 CLS
50 FOR I=1 TO 11:READ A$(I),B$(I
):NEXT I
60 FOR I=1 TO 11: READ C$(I),D$(
I):NEXT I
70 PRINT"       PUNCTUATION  MARK
S"
80 PRINT"  MARK        NAME"
90 PRINT"  ----        --------"
100 FOR A=1 TO 11:PRINT A TAB(2)
A$(A) TAB(13)B$(A): NEXT A
110 REM"CHOOSE A DECORATIVE PATT
ERN"
120 NN=128+RND(127)
130 PR$=STRING$(32,NN)
140 PRINTPR$;
150 PRINT@484,"PRESS <ENTER> TO
GO ON";
160 EN$=INKEY$
170 IF EN$=CHR$(13) THEN 180 ELS
E 160
180 FOR T= 1 TO 5
190 CLS
200 PRINT"       PUNCTUATION   QU
IZ":PRINT PR$;
210 R=RND(11)
220 PRINT@96,C$(R)
230 PRINT@192," ":PRINT@192,"ANS
WER";
240 INPUT E$
250 PRINT@288,PR$;
260 IF E$=D$(R) THEN SOUND 200,2
:PRINT@ 364,"CORRECT"
270 IF E$<>D$(R) THEN SOUND 20,3
:PRINT@362,D$(R):PRINT"IS THE CO
RRECT ANSWER THIS TIME."
280 PRINT@ 484,"PRESS <ENTER> TO
 GO ON";
290 EN$=INKEY$
300 IF EN$=CHR$(13) THEN CLS ELS
E 290
310 NEXT T
320 CLS RND(8):PRINT@96,"    PRE
SS <C> TO CONTINUE      OR <E
> TO END THE PROGRAM."
330 EN$=INKEY$
340 IF EN$="C" THEN RUN ELSE IF
EN$="E" THEN END ELSE 330
350 DATA ",",COMMA
360 DATA .,PERIOD,?,QUESTION MAR
K,!,EXCLAMATION POINT,;,SEMICOLO
N,":",COLON,-,HYPHEN
370 DATA (  ),PARENTHESES,[  ],B
RACKETS,'' '',QUOTATION MARKS,',
APOSTROPHE
380 DATA THIS COMES AT THE END O
F A     DECLARATIVE SENTENCE.,P
ERIOD
390 DATA THIS IS USED TO SHOW ST
RONG    FEELINGS OR EMOTIONS.,E
XCLAMATION POINT
400 DATA  THIS IS USED IN PLACES
 WHERE YOUWOULD PAUSE IN SPEAKIN
G.,COMMA
410 DATA THIS IS USED BETWEEN TW
O MAIN  CLAUSES NOT JOINED BY A
        CONJUNCTION.,SEMICOLON
420 DATA THIS IS USED BEFORE A L
IST OF  ITEMS.,COLON
430 DATA THIS IS USED TO SHOW PO
SSESSION OR OWNERSHIP.,APOSTROPH
E
440 DATA THIS IS USED TO DIVIDE
A WORD  INTO PARTS AT THE END O
F A LINE.,HYPHEN
450 DATA THESE ARE USED TO ENCLO
SE AN   EXTRA WORD OR WORDS.,PA
RENTHESES
460 DATA THESE ARE USED TO ENCLO
SE ITEMS FOUND WITHIN PARENTHESE
S.,BRACKETS
470 DATA THESE ARE USED TO SHOW
SOMEONE'SEXACT WORDS.,QUOTATION
MARKS
480 DATA THIS IS USED AT THE END
OF AN   INTERROGATORY SENTENCE.
,QUESTION MARK
```

FROM THE PEOPLE THAT BROUGHT YOU



COMPOSER

STEREO COMPOSER

MUSICA

STEREO PAK

MUSIC LIBRARY

SYNTHER 77 PLUS

MUSIC THEORY

SUPER SYNTH

PIANO KEYBOARD

COCO MIDI

MUSICA 2

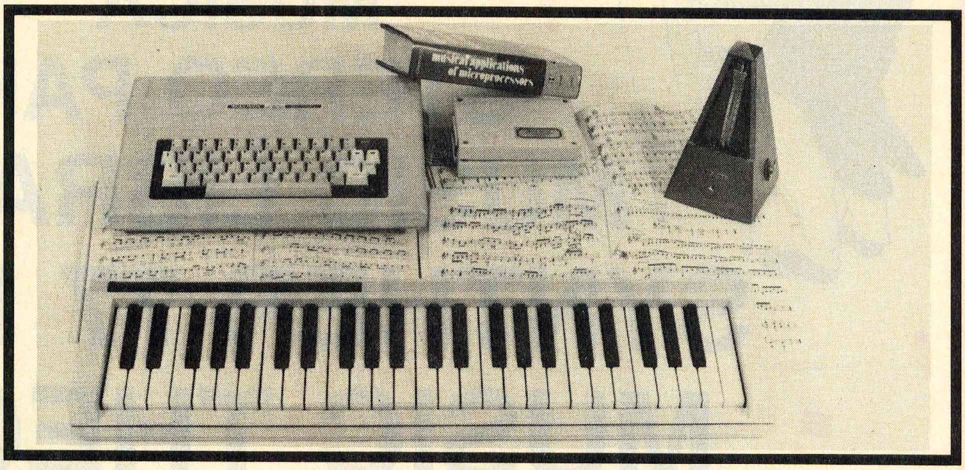
COMES . . .

SYMPHONY 12™

A 12 VOICE POLYPHONIC STEREO MUSIC SYNTHESIZER

$79.95 **$69.95** WHEN PURCHASED WITH MUSICA 2 **$59.95** WHEN PURCHASED WITH THE PIANO KEYBOARD

- 12 SIMULTANEOUS VOICES
- STEREO & MONO
- 4 NOISE GENERATORS
- SOUND EFFECTS
- PLAYS AND CREATES MUSICA 2 FILES



SUPER POLYPHONIC. Speech Systems is proud to bring you SYMPHONY 12, a polyphonic 12 voice hardware stereo music synthesizer for the Color Computer. SYMPHONY 12 also gives you 4 noise generators for percussion synthesis and sound effects. The PIANO KEYBOARD and MUSICA 2 (sold separately) turns your COCO into a real music machine with incredible flexibility.

STEREO and MONO. By connecting SYMPHONY 12 to your home stereo system, music is produced in stereo, 6 voices from each channel. However, you don't need to have a stereo system, all 12 voices also come out of your TV or monitor.

PICK AN INSTRUMENT. SYMPHONY 12 lets you choose from 10 preset instruments to synthesize chimes, violin, oboe, banjo, harpsichord, piano and more. You can even change instruments as the music plays.

SOUND EFFECTS. SYMPHONY 12 is a sophisticated sound generator. 12 voices and 4 noise generators give you incredible sound effect capability. We have included gun shot, explosion, racing car and more.

WATCH IT PLAY. As SYMPHONY 12 plays, a graphics display of a piano keyboard shows the notes playing. The display is entertaining as well as very educational.

PLAY MUSICA 2 FILES. Thousands of MUSICA 2 users will be excited to know SYMPHONY 12 plays all music developed using MUSICA 2 like you have never Seen or Heard it. In fact we highly recommend the use of MUSICA 2 as a composition development tool for SYMPHONY 12. Use MUSICA 2's superior graphics input capability and then play it through SYMPHONY 12. You can also take advantage of our MUSIC LIBRARY series (sold separately) to give you access to over 500 music pieces representing 20 hours of music.

ULTIMATE MUSIC DEVELOPMENT SYSTEM. SYMPHONY 12, MUSICA 2, and the PIANO KEYBOARD give you incredible flexibility. Imagine sitting down at the PIANO KEYBOARD, playing a piece and recording it as you play just as you would to a tape recorder. Save your masterpiece and then using MUSICA 2 edit it if you like and print it. If you have a MIDI synthesizer, you can take the music and play it using COCO MIDI (sold separately). Try that on an IBM, APPLE, or COMMODORE (good luck).

PIANO KEYBOARD. For those wishing to turn SYMPHONY 12 into a real polyphonic synthesizer we offer the extremely powerful and versatile PIANO KEYBOARD. The PIANO KEYBOARD was deisgned to be used in our entire music product line. You can use it with SYMPHONEY 12, MUSICA 2, SYNTHER 77 PLUS, and even our advanced speech synthesizer, SUPER VOICE.

When using MUSICA 2, you will be using 4 of the 12 voices available from SYMPHONY 12. To take advantage of the full 12 voice capability of SYMPHONY 12 you may use either the Color Computer's keyboard or the PIANO KEYBOARD.

Y-CABLE or MULTI-PAK. Tape users using both SYMPHONY 12 and the PIANO KEYBOARD will require a Y-CABLE. Disk users will require the Triple Y-Cable or MULTI-PAK.

SYMPHONY 12. You get over a dozen music and sound effect selections and complete documentation. Software is shipped on Tape or Disk.

OPTIONS

MUSIC LIBRARY (each volume)	$29.95
MUSICA 2	$29.95
PIANO KEYBOARD 2½ octave	$79.95
PIANO KEYBOARD 4 octave	$119.95

FREE BLANK DISK OR TAPE WITH EVERY ORDER

VISA MasterCard

Dealer Inquiries Invited

We accept CASH, CHECK, COD, VISA and MASTER CARD orders.

Shipping and handling US and Canada	$3.00
Shipping and handling outside the US and Canada	$5.00
COD charge	$2.00

Illinois residents add 6¼% sales tax

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1 MEGABYTE COLORAMA **(312) 879-6811 (24 HR. BBS)**

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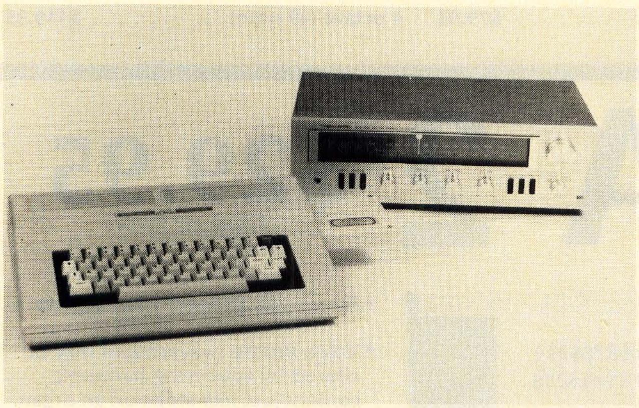
AWESOME

STEREO PAK™ $39.95

Plug this gem into your computer, connect to your home stereo system and sit back and enjoy music realism. The STEREO PAK is a hardware music synthesizer that plays our MUSIC LIBRARY series and MUSICA 2 music in stereo. Because it was designed specifically with music reproduction in mind, the sound is superb. The highs are crisp and clear while the bass notes will rattle your walls. Internally we use two high performance 8 bit digital to analog converters to assure fidelity.

The STEREO PAK is all hardware. It is intended as an enhancement for MUSICA 2 and our MUSIC LIBRARY series. Disk users will require our Y-CABLE or a MULTI-PAK.



NEW

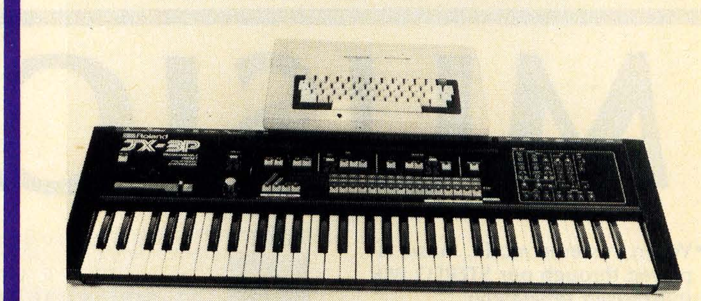
COCO MIDI™ $39.95

Tape or Disk

Now your COCO can talk to your MIDI music synthesizer. Whether you have a Korg, Roland, Casio, or Yamaha, it doesn't matter as long as it's MIDI equipped.

COCO MIDI takes any MUSICA 2 music file and plays it through your music synthesizer. We offer you over 500 tunes from our MUSIC LIBRARY series (sold separately) or create your own music using the best music composition program available, MUSICA 2 (sold separately).

COCO MIDI includes: documentation, plenty of music, and the cable to connect between the COCO and your synthesizer.



20 HOURS OF MUSIC

MUSIC LIBRARY™ $29.95

Tape or Disk

The MUSIC LIBRARY series consists of 5 volumes: 100, 200, 300, 400, and 500 each sold separately. Each contains over 100 four voice music selections with a playing time of over 3 hours each. The disk version is shipped on 5 full disks. When coupled with the STEREO PAK, the music is reproduced with unsurpassed realism.

A JUKEBOX program is included to allow you to select specific songs or automatically play each. These songs are ready to go, you don't need MUSICA 2 or a knowledge of music. MUSICA 2 users may customize each song. Requires minimum of 32K.

MUSIC LIBRARY 100

Stage, Screen, & TV
Music of the 70's
Music of the 60's
Music of the 50's
Old Time Favorites
Classical
Christmas (popular)
Christmas (traditional)
Patriotic
Polka Party

MUSIC LIBRARY 200 (another 100 selections)
MUSIC LIBRARY 300 (another 100 selections)
MUSIC LIBRARY 400 (another 100 selections)
MUSIC LIBRARY 500 (another 100 selections)

Each volume sold separately, specify tape or disk.

SAVE $50!

Write for complete list.
ALL 500 $99.95

NEW

SYNTHER 77 PLUS $29.95

Tape or Disk

We put the PLUS in SYNTHER 77 PLUS by connecting our PIANO KEYBOARD so you can really play your COCO like a piano.

You control vibrato pattern, Bender rate, Volume level as well as Attack, Decay, Sustain, and Release (ADSR envelope). As you play you can record, then edit and save it to disk or tape. You can even fine tune it to match other instruments.

The PIANO KEYBOARD is not necessary, you can use your COCO keyboard but the PIANO KEYBOARD makes your COCO a real music instrument.

FOR
MUSICA 2
SUPER VOICE
SYMPHONY 12
SYNTHER 77

PIANO KEYBOARD

Now you can really play your Color Computer and pick any or all 4 instruments: **MUSICA 2, SYNTHER 77 PLUS, SUPER VOICE,** and the ultimate **SYMPHONY 12.**

MUSICA 2 users can use the PIANO KEYBOARD as an easy method to input music. Version 2.6 is required. Previous users may obtain an update by returning original tape or disk with $7.00.

SYNTHER 77 PLUS turns your COCO into a music synthesizer without any additional hardware. You specify Vibrato, Bender, Volume, as well as Attack, Decay, Sustain, and Release (ADSR).

SUPER VOICE, COCO's most advanced speech synthesizer becomes a music synthesizer when connected to the PIANO KEYBOARD.

SYMPHONY 12 and the PIANO KEYBOARD gives you a professional 12 voice music synthesizer.

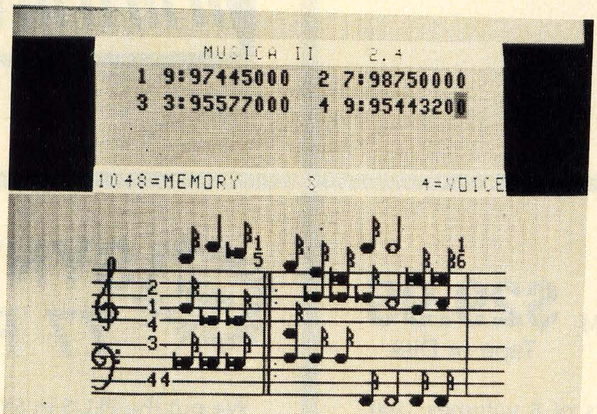
These Piano Keyboards are not toys. They are the same style, shape, size, and feel as professional synthesizer keyboards. Disk owners must use a Y-CABLE or MULTI-PACK.

2½ octave (32 note) . . . . **$79.95** **4 octave** (49 note) **$119.95**

MUSICA 2 $29.95

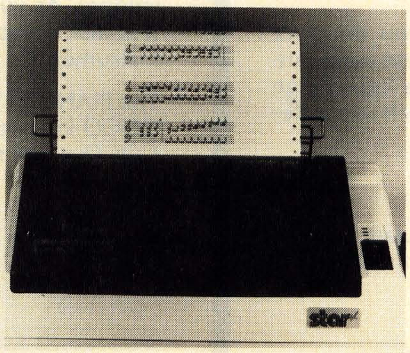
Tape or Disk

- When in stereo mode, music is played through our STEREO PAK (purchased separately).
- Loudness of each voice may be individually specified.
- Memory available is constantly displayed.
- Voice waveshapes may be exchanged between voices at any point.
- Tempo may be specified and may even be altered as the music plays.
- Flats and sharps supported.
- Billions of timbre combinations.
- High resolution graphic display, looks just like sheet music.
- MUSICA 2 is 100% software, no need for hardware unless you want music produced in STEREO. In that case, the STEREO PAK may be purchased separately. It's a must for the audiophile!
- Repeat bars allow repeating of music without re-inserting music a second or third time.
- 30 page manual describes all.
- Requires minimum of 32K.



```
        MUSICA II    2.4
   1 9:97445000  2 7:98750000
   3 3:95577000  4 9:95443200
1048=MEMORY     3       4=VOICE
```

- Output music to your printer (Gemini 10X, Epson, R.S. printers).



- Allows you to specify key signature.
- Voice timbre (waveshape) may be altered by specifying harmonic content just like stops on an organ.
- During editing, voice being inserted is displayed.
- Each measure is numbered for easy reading of music.
- Measure bars aid in reading and developing music.
- Each voice may be visually highlighted for easy identification.
- 4 Voices produced simultaneously.
- Input notes from Coco keyboard, joystick, or Piano Keyboard.
- Play music from your own BASIC program.
- Block copy music for easy music development.
- 100% machine language so it is lightning fast.
- Vibrato effect easily produced.
- With STEREO PAK, voices may be switched between left and right speakers as music plays.
- Durations include: whole, half, quarter, eighth, sixteenth, thirty-second, sixty-fourth, and triplet.

MUSIC THEORY

An advanced music course that covers Major and Harmonic Minor scales, interval spelling, Triad (Chord) theory, Inversions, Dominant 7th chords, and interval ear training. Format of the course includes drill and practice sessions, a scorecard to measure progress, graphics and sound output, and a reviewing session.
32K Disk only $49.95

‘SUPER VOICE’ T.M.

COCO’S MOST ADVANCED SPEECH SYNTHESIZER.

IT TALKS, SINGS AND MORE.

only . . . $79.95

WITH EARS OR PIANO KEYBOARD PURCHASE

only . . . $59.95

musical applications of microprocessors

SUPER VOICE is no ordinary speech synthesizer. It uses Silicon Systems, Inc. SSI-263, the most advanced speech/sound chip available. SUPER VOICE is not only capable of highly intelligible speech, sound effects, and singing over a 6 octave range, but now we have turned SUPER VOICE into a monophonic Super Music Synthesizer with our PIANO KEYBOARD.

IT TALKS. A free TRANSLATOR text-to-speech program makes writing your own talking program as easy as SAYING “HELLO.”

SUPER VOICE works in any 32K or 64K computer. A disk system requires a Y-Cable or Multi-Pak.

Here are the facts; the decision is yours.

	SUPER VOICE	REAL TALKER	RS SPEECH CARTRIDGE	VOICE-PAK
Synthesizer Device	SSI-263	SC-01	SP-256	SC-01
Speaking Speeds	16	1	1	1
Volume Levels	16	1	1	1
Articulation Rates	8	1	1	1
Vocal Tract Filter Settings	255	1	1	1
Basic unit of Speech	64 phonemes 4 durations each	64 phonemes	64 allophones 5 pause lengths	64 phonemes
Pitch Variations	4096 (32 absolute levels with 8 inflection speeds)	4	1	4

FREE “REACTION” To Test Your Reflexes

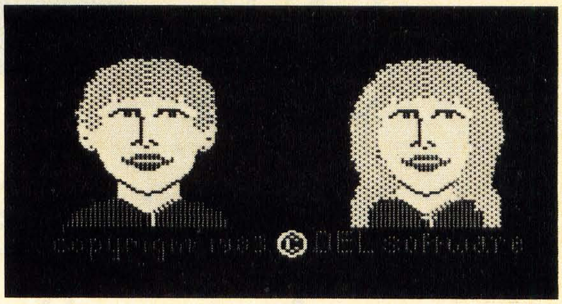
FREE SUPER VOICE SINGS THE STAR SPANGLED BANNER

FREE “SIMON” To Test Your Memory

FOOL’S CROSSING

The world’s first TALKING HI-RES GRAPHICS adventure. Finding the hidden treasure is the easy part, getting back home is another story. FREE EARS to the first one to submit a solution.

32K Disk **$24.95**



SUPER TALKING HEADS

When the SUPER VOICE speaks in a low pitched voice, the man speaks, when a high pitched voice is used the woman speaks. **$24.95**

FREE BLANK DISK OR TAPE WITH EVERY ORDER

VISA® MasterCard

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We accept CASH, CHECK, COD, VISA and MASTER CARD orders.

Shipping and handling US and Canada	$3.00
Shipping and handling outside the US and Canada	$5.00
COD charge	$2.00

Illinois residents add 6¼% sales tax

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1 MEGABYTE COLORAMA **(312) 879-6811 (24 HR. BBS)**

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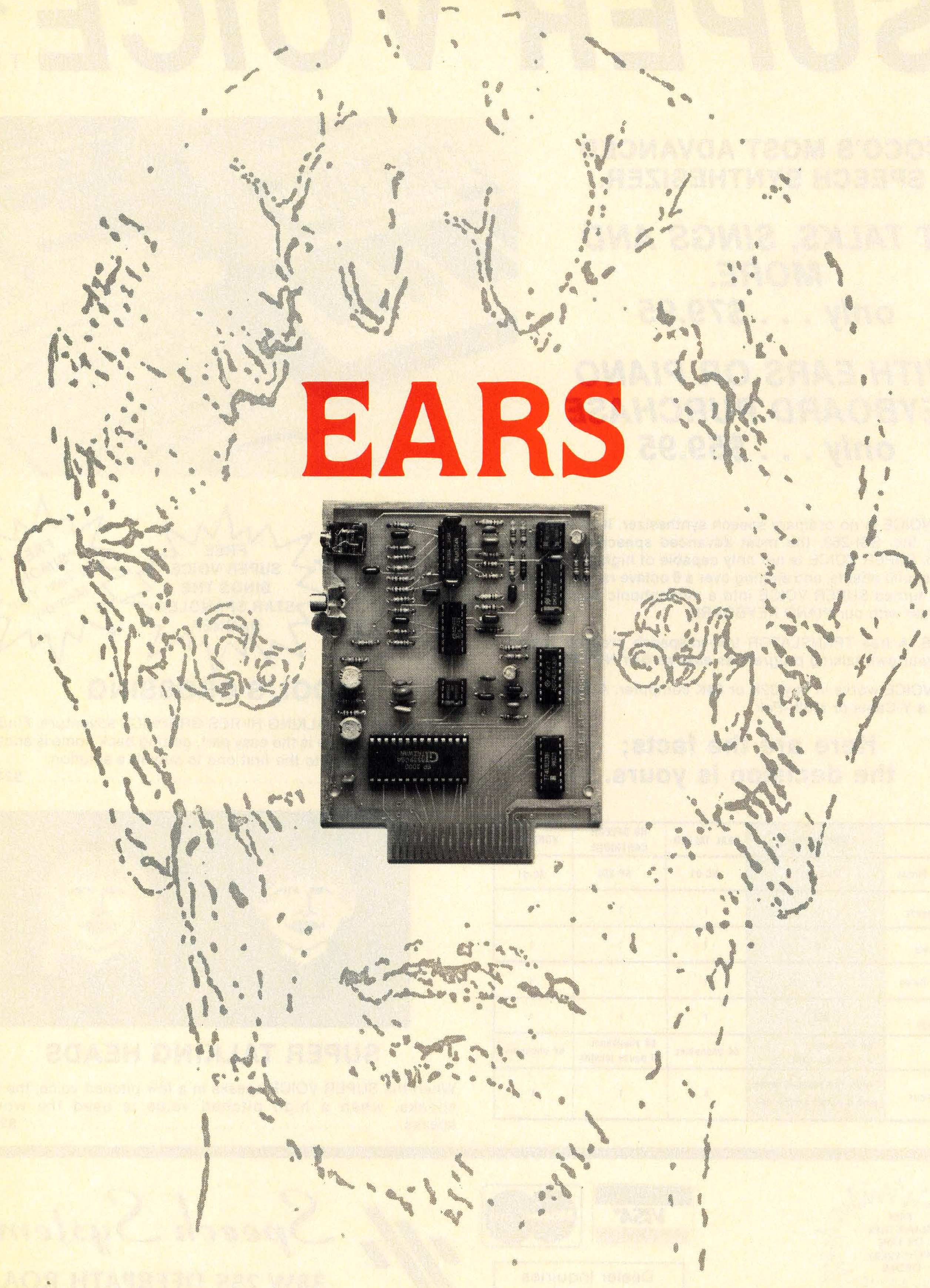
EARS



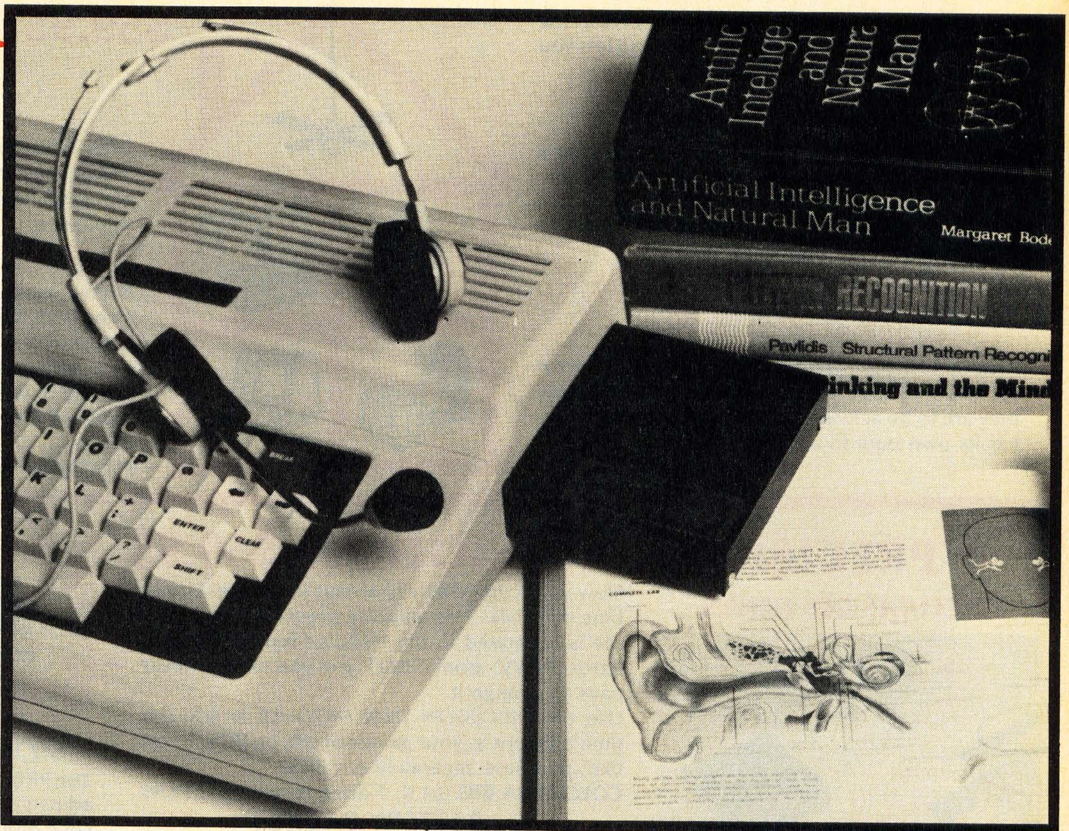
Electronic Audio Recognition System

Now Your Computer Can Listen To You!

EARS™

Electronic
Audio
Recognition
System

$99.95


Artificial Intelligence and Natural Man
Margaret Bode
RECOGNITION
Pavlidis Structural Pattern Recogni
inking and the Mind

- SPEECH RECOGNITION
- HANDS OFF PROGRAMMING
- HIGH QUALITY SPEECH REPRODUCTION

EARS Does It All!

INCREDIBLE!

Two Years In the Making. Speech Systems was formed to develop new and innovative speech products. After 2 years of intensive Research and Development, we have created a truely sophisticated speech recognition device. Recognition rates from 95% to 98% are typical. Until now, such a product was outside the price range of the personnel computer market, and even small businesses.

EARS is trained by your voice and capable of recognizing any word or phrase. Training EARS to your particular voice print takes seconds. Up to 64 voice prints may be loaded into memory. You may then save on tape or disk as many as you like so that your total vocabulary is virtually infinite.

Speech and Sound Recognition. EARS is really a sound recognition system, so it really doesn't matter whether you speak in English, Spanish, or French. In fact you do not have to speak at all, you can train EARS to understand sounds such as a musical note or a door slamming.

Hands Off Programming. Imagine writing your own BASIC programs without ever touching the keyboard. Everything that you would normally do through a keyboard can now be done by just speaking.

Programming EARS Is Easy. LISTEN, MATCH and other commands have been added to BASIC so that programming EARS is a piece of cake! The single BASIC line: 10 LISTEN: MATCH will instruct EARS to listen to you and return the matching phrase.

It Talks. EARS is also capable of high quality speech. We mean REALLY high quality. The speech is a fixed vocabulary spoken by a professional announcer. Speech Systems is currently creating a library of thousands of high quality words and phrases. For a demonstration call **(312) 879-6844**, you won't believe your ears or our EARS.

DISK OWNERS. EARS will work with any disk system with either a MULTI-PAK or Y-CABLE. Our new Triple Y-CABLE was specifically developed for those wishing to add SUPER VOICE as a third device.

You Get Everything You Need. You get everything you need including a specially designed professional headset style noise cancelling microphone. The manual is easy to use and understand. Several demonstration examples are included so you don't have to write your own programs unless you want to. EARS will work in any 32K or 64K Color Computer.

SUPER VOICE $20 OFF

Imagine talking to your computer and it talking back to you. When you need an unlimited vocabulary, you can't beat SUPER VOICE. For a limited time, we will give you the SUPER VOICE for $59.95 with your EARS purchase. Even if you already have another speech unit, here is your chance to buy the best and save $20.

VOICE CONTROL

Applications for EARS are astounding. Here is our first of many listening programs to come. VOICE CONTROL is a program specifically designed to allow you to control any appliance in your house with your voice and our HOME COMMANDER (sold separately). For example, you can control your TV by saying "TV ON" or TV OFF". $24.95

FREE BLANK DISK OR TAPE WITH EVERY ORDER

VISA® MasterCard

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We accept CASH, CHECK, COD, VISA and MASTER CARD orders.

Shipping and handling US and Canada	$3.00
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'HOME COMMANDER'

$59.95

VOICE CONTROL
APPLIANCES
WITH EARS

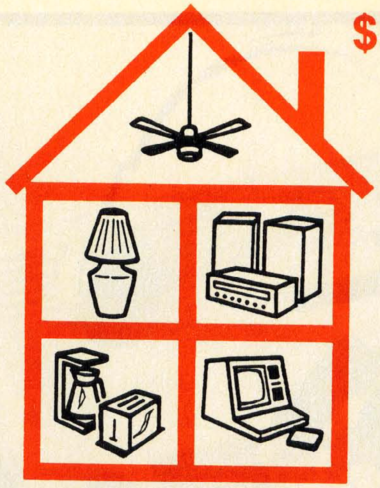
The HOME COMMANDER easily connects to the cassette port of your Color Computer and lets you control appliances in your home.

NO WIRES NECESSARY

The HOME COMMANDER uses your home's existing electrical wiring to control virtually anything. Appliances are controlled via small control modules available at your local SEARS or Radio Shack store.

ON FRIDAY 7:42 PM, OFF
SUNDAY 1:26 AM

Included FREE is a program to allow you to control up to 256 devices and specify the time and date they are to be activated. That's right, the software has its own built in accurate clock.



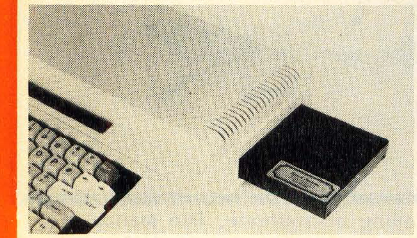
Imagine controlling a light or TV with your voice. When used with our Electronic Audio Recognition System, EARS, you can literally control any appliance.

PLUG'N POWER USERS

If you were disappointed in the software that came with the Radio Shack PLUG'N POWER unit, and you probably were, we'll offer you our powerful software separately. An early version is described in the Feb., April, June, and August 1983 issues of RAINBOW. Our current version is even better. **$19.95**
PLUG'N POWER is a trademark of Radio Shack®

PRECISION TIME MODULE $59.95

— INCLUDES OS9 DRIVER —



Now your computer will always know the correct time and date. This amazing precision time module is calibrated to the National Bureau of Standards (WWV) atomic clock and you should never have to change it.
Use the PRECISION TIME MODULE to add the time element to your games or use on BBS. If you like, purchase separately our BBS.
COLORAMA BBS (64 K, 1 drive minimum) **$99.95**

BATTERY BACKUP

Even when your computer is off, the clock keeps correct time by operating using the internal battery backup system.

THE
TIMEPIECE
FOR THE
COLORAMA
BBS

FREE
TALKING CLOCK
PROGRAM
requires VOICE,
SUPER VOICE,
or
SPEECH & SOUND PAK

MONTHS, LEAP YEARS & DST

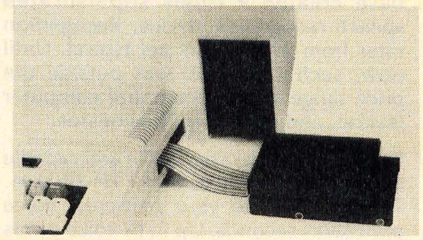
The PRECISON TIME MODULE automatically adjusts for the different number of days in each month as well as leap years. And believe it or not, it adjusts for DST so you don't have to remember if it's SPRING FORWARD or FALL FORWARD.

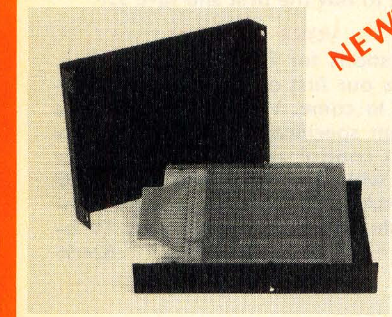
Y-CABLE $28.95

Why pay $100 to $200 for a multi-pak. With the Y-CABLE, you can connect your disk system to your computer along with either our STEREO PAK music synthesizer, our VOICE, SUPER VOICE speech synthesizers, or our PRECISION TIME MODULE. All connectors gold plated.

TRIPLE Y $34.95

We developed the Triple Y-Cable specifically for those interested in both speech synthesis and speech recognition. The Triple Y-Cable lets you connect EARS and SUPER VOICE to your color computer along with your disk system.





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Computers Can Play An Important Role In Art Education

By Michael Plog, Ph.D.
Rainbow Contributing Editor

When dealing with computers and education, the subject matter area getting the short end of the electronic stick is the arts. This is understandable in some ways, but really doesn't make much sense — for the arts or for education.

In general, elementary schools use computers most frequently with math, followed by language arts, reading, computer programming, social studies, science and then art. (This is a finding from the National Commission for Employment Policy, "Uses of Computers in Education," conducted by Education Turnkey Systems, Inc.) We can easily understand why computers are most frequently used with mathematics. After all, computers are mathematical calculating machines, and math teachers have been trained in such things as calculating machines. Art teachers are creative people who deal with such things as paint, clay or other products.

Of course, the concept of "art" covers a wide range of activities. There are the performing arts, such as dance, theater, mime, magic, music and so on. Commercial art covers such things as photography and drafting. Some schools even include film making in the curriculum.

The amazing thing is that in most fields of art the computer has been used by professional artists, but not in the schools, where students are usually introduced to the arts. Much of the past "computer art" depended on the ability of the computer to produce random numbers. Then, a song or painting or some other artistic product was created using the random numbers.

The random effect has been used in the past with some degree of success. Mozart (in 1777) composed a piece of music by using dice to help pick a scale. One hundred and eighty years later (1957), Lejaren Hiller and Leonard Isaacson composed the "Iliac Suite for String Quartet" using random numbers generated by a computer. Generally, however, the random number approach to art results in a product that is appreciated only by the artist (if that much).

There is much more to computer-assisted art (and art education) than random numbers. We listen to a lot of computer music. Moog synthesizer and electronic guitars are commonplace today. The computer provides not only the music, but in some cases, provides the structure of a piece and relieves the artist of many mundane tasks, from writing musical notes to reading them. Vangelis, who provided the score for the movie *Chariots of Fire,* cannot read music. But, he can generate art.

Computers are used to help in all kinds of animation, from Saturday morning cartoons to commercials. In fact, were it not for computers, we would have much less animation today than in the past. Salaries have increased a lot since Walt Disney directed a team of animators.

Computer-generated graphics are not only used to present subatomic particles and the structure of DNA (which looks like art to me), but pieces that hang in museums. Computers have been used to analyze the movements of dancers and runners for training purposes. John Swartzwelder has even used a CoCo to create one-line jokes (example: Scientists discover new moon orbiting Kate Smith). Computers have been used to mathematically analyze prose and poetry of great masters and then mimic that style to produce (some not so great) literary efforts.

So, if artists use computers, why should art students not be using them? There are several reasons. First, we do not expect students, especially elementary students, to produce great works

---

(Michael Plog received his Ph.D. degree from the University of Illinois. He has taught social studies in high school, worked in a central office of a school district, and currently is employed at the Illinois State Board of Education.)

of art. We expect them to learn about art instead of attempting to compete with professionals. Second, most of the computer applications mentioned here involve rather sophisticated software, which artists are unwilling to share with a group of elementary students. Also, there are few software publishers who provide computer-assisted instruction packages (still the most frequent use of computers in schools) for art. Finally, art teachers may not realize what students can do with the help of a computer.

I hold the position that students — even in primary grades — can use the computer to help them learn about the arts. I believe students should learn art by actually doing it. They should learn about painting by organizing colors and shapes; about music by organizing sound in meaningful patterns; about dance by studying movement.

Consider the easiest one first: music. My nephew recently showed me a music program for the Color Computer. The screen shows the music staffs, and by movement of the cursor and command keys, notes are placed on the staff. It seems to make sense that students would learn about music by writing it and listening to their compositions being played. The teacher could introduce such concepts as chords and harmony by showing students how to improve their own music. The students have a stake in their creations. Music by other people becomes more "real" to one who has written music.

It is difficult to convince a band to play a piece of music written by an elementary student. Especially when there may be 30 such students, each wanting to hear their own creation 100 times. It is not so difficult, on the other hand, to convince the Color Computer to play a musical composition written by a student. It is easy for the student to make changes in the music stored in a Color Computer and hear the results. It is hard for a student to change a few notes in a piece of music and expect a "live" band to immediately play again the altered piece. Thus, this piece of software seems to be an ideal teaching tool.

The initial barriers keeping the teacher away from the student are more easily overcome. The student learns about music by actively engaging in the process of organizing sound. It seems reasonable that such an approach would increase the motivation to learn how to play an instrument.

How about other arts? The computer can be used to help the student learn about painting as well as music. The Color Computer has some wonderful graphics packages. Students can first create, then print their masterpiece on paper to be displayed on the refrigerator door.

Beginning students make simple mistakes that can ruin an art project. With a graphics package, it is easy to correct these little problems before the final product is ready. This makes the final product easier to accept, as well as giving the student a valuable lesson that art is a dynamic, changing expression rather than a "first time only" event.

In kindergarten classes, a pre-art activity is to learn colors and shapes. The Color Computer is an ideal machine for computer-assisted instruction with kindergarten students. It is easy to imagine a student running a program which draws a triangle on the screen while the cassette recorder is talking about triangles. The triangle is colored red while the cassette provides a verbal explanation of the color red. As with all computer-assisted instruction packages, a major advantage is that the student can participate in the lesson as many times as needed.

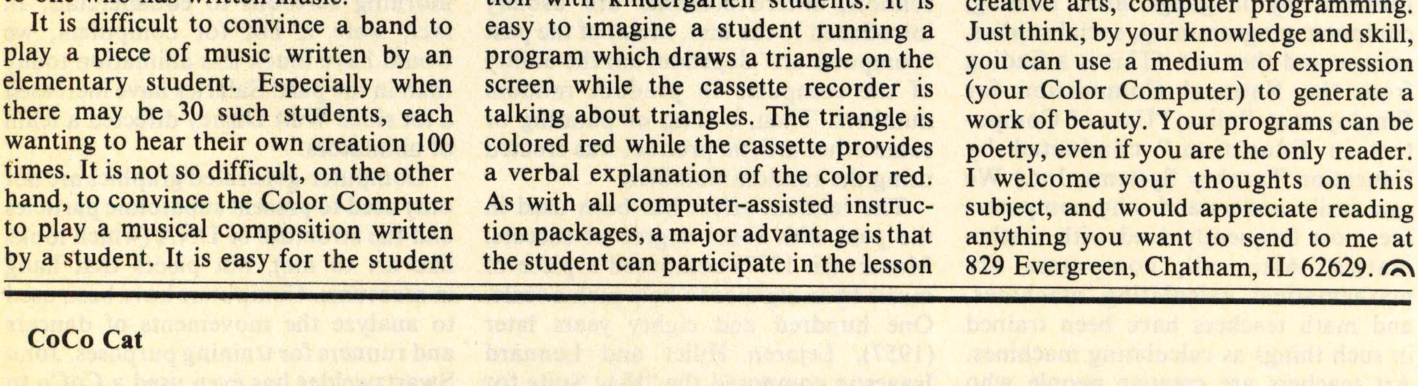
Now, I do not know if such a program is already on the market. I doubt that it would require a master programmer to put together a unit on colors and shapes. If you have written one, please let me know about it and I will share that information through these pages.

So far, we have presented examples of computer-assisted art lessons for primary students. The same graphics packages mentioned could be used as a supplemental activity in a drafting class in a high school. The student could design the initial drafting project using a commercial graphics package, then complete the paper version based on changes and corrections made to the electronic rough sketch. Dance students in high school could use the screen as a model of a stage for choreographing movement, then translate the mental image to physical movement.

There is probably no end to the opportunities offered students with this blend of the computer and the arts. Before leaving this idea, a pratical point should be raised. The arts are a very important part of education and one of the key subject matter areas for students to learn about our cultural heritage. Yet, when budget crunches happen in schools, the arts often suffer the most. The use of computers can help continue this crucial part of education while still allowing for budget reductions.

I must mention one of the most creative arts, computer programming. Just think, by your knowledge and skill, you can use a medium of expression (your Color Computer) to generate a work of beauty. Your programs can be poetry, even if you are the only reader. I welcome your thoughts on this subject, and would appreciate reading anything you want to send to me at 829 Evergreen, Chatham, IL 62629.

CoCo Cat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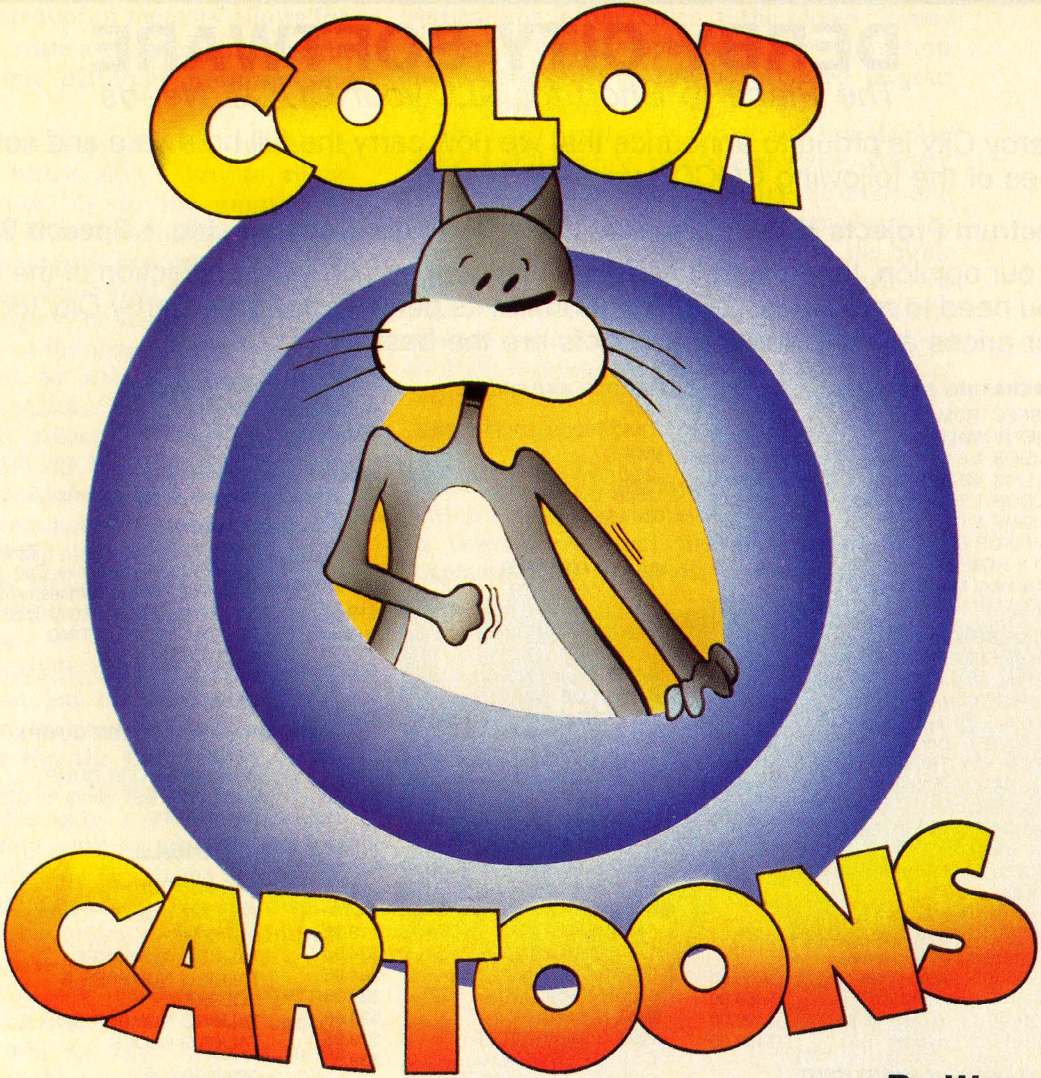


COLOR CARTOONS

By Wayne Thume

You may not fill your local theater, but you can create animation that will impress your friends and family

Along with many others, I have always wanted to experiment with animation. Being an avid "Bugs Bunny" fan, I've often said to myself, "Hey! I'd like to make cartoons, too." Now with the help of my Color Computer and this program, I can create animation for games, graphics demonstrations or just for fun.

The first problem confronted in designing this program was space. I wanted the pictures for the animation to be held in the computer's memory and not on tape or disk. Since storing too many pictures would take up an incredible amount of space, I decided to reduce each picture to a 16-by-32 grid.

Now before you quit reading this article in disgust, let me assure you there is more than enough room for significant high resolution animation. Using this grid 96 pictures can be created, which will allow for about 20 seconds of animation. I'll be the first to admit that 20 seconds doesn't sound like very long, but after drawing 96 pictures you will be convinced that it is far too long.

The next problem was which language to write the program in. I chose BASIC so anyone could easily interpret and modify the program to suit his or her own tastes. Using `GET` and `PUT`, I was able to store and retrieve pictures at the high rate of speed that is needed to show the animation. The pictures are stored on pages five through eight of the graphics memory. They are displayed on the Hi-Res screen `PMODE 4,1` which uses the first four pages of graphics memory.

(Wayne Thume works as a programmer/operator at Airpax Corporation, a division of North American Phillips. He did his first programming on the Color Computer. Wayne lives in Trappe, on the Eastern Shore of Maryland.)

Using this small amount of memory allows for enough room to create a program to utilize the graphics for some different programming applications.

After the program is typed in and run, there will be a menu which allows you to either 1) create a picture, 2) see the animation, 3) save animation, 4) load animation or 5) quit the program. Choosing the first option will take you to the Hi-Res screen `PMODE 4,1` where there is a flashing rectangle. The size of the rectangle represents the size of the area you may animate. The rectangle may be moved to any area of the screen with a joystick. Once you have chosen the area to animate, press the joystick firebutton and the area within the flashing rectangle will be enlarged and placed on the Lo-Res screen. You have several commands to create the picture at this point (these are all summarized in a chart at the end of this article). Once your picture is finished, it will be stored and you will again return to the menu.

The second option in the menu will display the animation that has been created. If you choose this option, the computer will switch to the Hi-Res mode and the first picture in the animation sequence will be shown. To start the animation, press the space bar. You may stop the animation at any point by pressing any key other than the space bar. To resume animation, press the space bar again. To quit the display sequence before it has ended, press 'Q' and the program will return to the menu.

Option three will save the picture sequence on cassette tape or disk drive. If you choose this option, you will see what appears to be garbage forming at the top of the screen. This "garbage" is actually the screen locations for all 96 pictures that have been poked into the video memory. The program stores all of the information in two files, one for the screen locations of the pictures and one for the pictures themselves. Once you have given a filename and specified tape or disk, the computer will save the data and return to the menu.

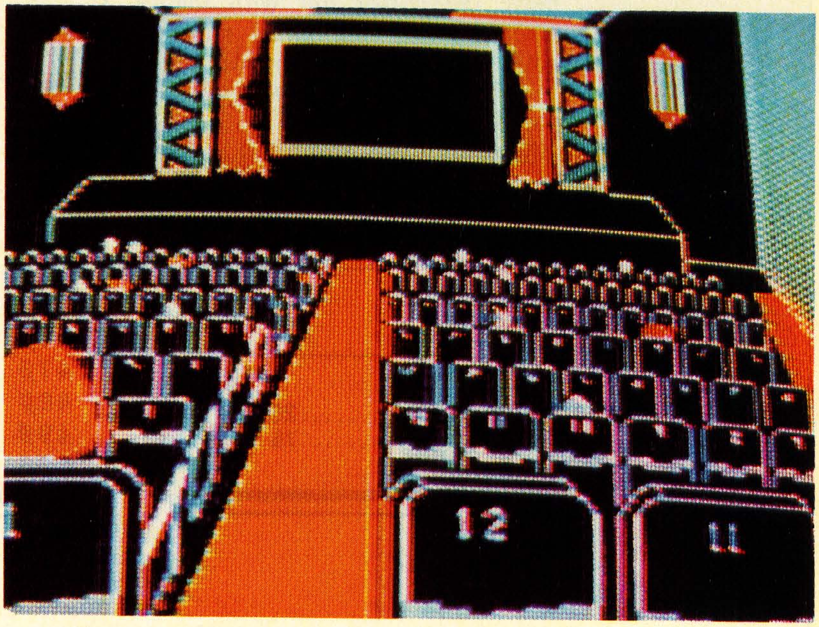
With the fourth option you will be asked for the name of a file that has been previously saved. Once this is entered, merely specify whether you are using tape or disk drive and the computer will load the pictures and return to the menu.

The last option allows you to exit the program. The screen will clear and return to the BASIC mode.

There are many areas of the program that are not explained adequately, so I have included a sample animation program. Since an actual cartoon would be too long to create, I had to stick to a simple graphics demonstration. The animation is that of a circle traveling in sine wave moving downward. The circle is simultaneously passing back and forth across a vertical line in the center of the screen. It may not be the best example, but it does show how much greater speed can be achieved in your BASIC programs.

When the program is run, it will first display a line and the circle, then the program will `GET` the 16-by-32 area which includes the circle and part of the line. Next the computer clears the screen and redraws the picture with the circle moved to the new position. Slowly, each new position is drawn and recorded until the circle reaches the bottom. The reason it takes so long to draw this sequence is because the computer must draw and erase each picture before it can draw the next one.

After this sequence has been recorded the animation will be displayed. First, some colorful patterns are drawn on either side of the screen to demonstrate that the animation can be displayed on a screen without having to erase any picture which may already be there. Next, you will see the circle move down the screen — note the smooth and quick movement as the circle glides down the screen.



And now to explain the gimmick. Refer to the graphics picture above. There is no program included to draw this picture. The fact is, I drew this picture dot by dot with a graphics editor and it would be impossible to create a short program to reproduce it. When I create my animation, I display it on the little movie screen in the picture; this makes my feeble cartoons look much more impressive.

If you would like a copy of this screen, I would be glad to send one if you send me a tape or disk and enough money to pay for postage to send it back. I would also like to see any animation you create using my program. My address is Route 2, Box 119, Trappe, MD 21673. □

**Summary of Commands for Option 1:
Create Picture**

Key	Function
Arrow keys —	will move dot around screen to desired position
S —	sets point on the screen
R —	resets point on screen
O —	Shows Hi-Res screen `PMODE 4,1`. Press any key and it will switch to `PMODE 4,5` where the pictures are stored. Press any key again and the computer will return to the Lo-Res screen.
G —	gets any of the 96 pictures you choose and puts it on the screen
C —	clears screen
X —	switch mode. The first time this is pushed you will be given the option to choose the (S)et or (R)eset mode. Now when you move the cursor dot with the arrow keys, it will either erase points or set points wherever it moves. To exit this mode press the 'X' key again.
Q —	quit and return to the menu

```
270 .......25
END .......75
```

Listing 1: `ANIMATE`

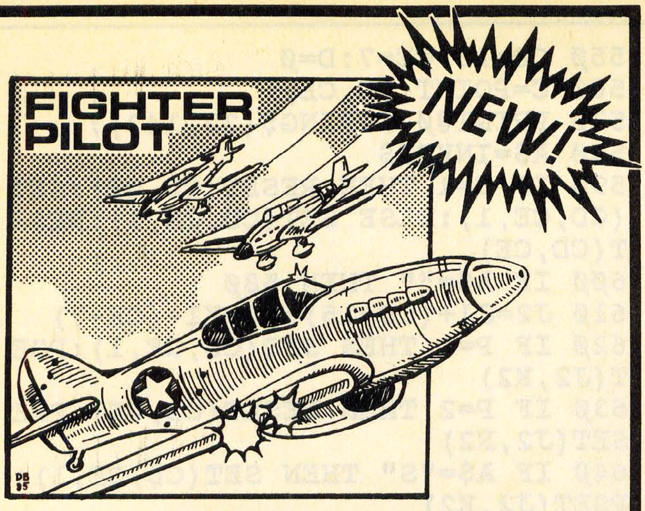
```
10 PCLEAR 8
20 PMODE 4,1
30 SCREEN 1,1
40 Z=1:B=8
50 DIM S(32,16)
60 FOR X=0 TO 255 STEP 32
70 FOR Y=0 TO 191 STEP 16
80 GOSUB 140
90 GET(112,B-7)-(143,B+8),S,G
100 PMODE 4,5
110 PUT(X,Y)-(X+31,Y+15),S,PSET
120 NEXT Y,X
130 GOTO 270
140 PMODE 4,1:PCLS
150 B=B+1
160 A=SIN(Z)*10
170 A=A+128
180 IF C=1 THEN C=0:GOTO 250
190 CIRCLE(A,B),5
200 C=1
210 LINE(127,0)-(127,192),PSET
220 LINE(128,0)-(128,192),PRESET
230 LINE(129,0)-(129,192),PSET
240 Z=Z+.1:GOTO 260
250 Z=Z+.1:GOTO 140
260 RETURN
270 REM SEE ANIMATION
280 PMODE 4,1:PCLS
290 PMODE 3,1
300 FOR UO=1 TO 4:PCLS UO:NEXT:P
CLS2
310 PMODE 4,1:SCREEN 1,1
320 LINE(112,0)-(143,192),PRESET
,BF
330 LINE(9,9)-(102,182),PSET,BF
340 LINE(153,9)-(246,182),PSET,B
F
350 LINE(127,0)-(127,192),PSET
360 LINE(129,0)-(129,192),PSET
370 CIRCLE(56,96),40,0
380 CIRCLE(199,96),40,0
390 W=7
400 FOR X=0 TO 255 STEP 32
410 FOR Y=0 TO 191 STEP 16
420 PMODE 4,5
430 GET(X,Y)-(X+31,Y+15),S,G
440 PMODE 4,1
450 PUT(112,W)-(143,W+15),S,PSET
460 W=W+2
470 NEXT Y,X
480 CLS:PRINT@228,"AGAIN (Y/N)";
490 A$=INKEY$:IF A$="" THEN 490
500 IF A$="Y" THEN SCREEN 1,1:W=
1:GOTO 390
510 END
```

```
210 .......237
470 ........73
660 .......153
960 .......194
1240 ......166
1520 ......173
1790 ......141
END ........51
```

Listing 2: `DEMO`

```
10 PCLEAR 8
20 DIM S(32,16)
30 DIM T(97,2)
40 PMODE 4,1
50 AB$="NONE"
60 CLS
70 SCREEN 0,0
80 PRINT@40,"graphic";
90 POKE 1071,32
100 PRINT@48,"animator";
```

```
110 PRINT@73,"BY WAYNE THUME"
120 PRINT@133,STRING$(21,"x")
130 PRINT@160,"      x<1> CREATE
PICTURE x"
140 PRINT      "          x
        x"
150 PRINT"      x<2> SEE ANIMATIO
N  x"
160 PRINT      "          x
        x"
170 PRINT"      x<3> SAVE ANIMATI
ON x"
180 PRINT"      x
  x"
190 PRINT"      x<4> LOAD ANIMATI
ON x"
200 PRINT"      x
  x"
210 PRINT"      x<5> QUIT
  x"
220 PRINT@453,STRING$(21,"x")
230 A$=INKEY$
240 IF A$="" THEN 230
250 ON VAL(A$) GOTO 270,1270,143
0,1810,2120
260 GOTO 230
270 REM CHOOSE PICTURE
280 CLS
290 PRINT"LAST PICTURE: ";AB$
300 PRINT@224,"WHICH PICTURE ";
310 INPUT AB$
320 IF VAL(AB$)<1 OR VAL(AB$)>96
 THEN 300
330 REM CREATE PICTURE
340 SCREEN 1,1
350 J=JOYSTK(0):K=JOYSTK(1)
360 J1=J*3.57:K1=K*2.82
370 GET(J1,K1)-(J1+31,K1+15),S,G
380 PUT(J1,K1)-(J1+31,K1+15),S,P
RESET
390 C=PEEK(65280):T=J1:U=K1
400 IF C=126 THEN R=X:GOTO 440
410 IF C=254 THEN R=X:GOTO 440
420 PUT(J1,K1)-(J1+31,K1+15),S,P
SET
430 GOTO 330
440 REM ENLARGE PICTURE
450 V=VAL(AB$):T(V,1)=T:T(V,2)=U
460 SCREEN 0,0
470 PUT(J1,K1)-(J1+31,K1+15),S,P
SET
480 CLS
490 FOR X=15 TO 46
500 FOR Y=7 TO 22
510 C=PPOINT(J1+(X-15),K1+(Y-7))
520 IF C=1 THEN SET(X,Y,1) ELSE
RESET(X,Y)
530 NEXT Y,X
540 REM START
550 CD=15:CE=7:D=0
560 C=POINT(CD,CE)
570 PRINT@0,STRING$(32,143);
580 A$=INKEY$
590 IF C=1 THEN RESET(CD,CE):SET
(CD,CE,1):ELSE SET(CD,CE,1):RESE
T(CD,CE)
600 IF A$="" THEN 580
610 J2=J1+(CD-15):K2=K1+(CE-7)
620 IF P=1 THEN SET(CD,CE,1):PSE
T(J2,K2)
630 IF P=2 THEN RESET(CD,CE):PRE
SET(J2,K2)
640 IF A$="S" THEN SET(CD,CE,1):
PSET(J2,K2)
650 IF A$="R" THEN RESET(CD,CE):
PRESET(J2,K2)
660 IF A$="X" THEN GOSUB 810
670 IF A$="C" THEN GOSUB 900
680 IF A$="G" THEN GOTO 1000
690 IF A$="O" THEN GOSUB 1100
700 IF A$="Q" THEN GOTO 1200
710 IF A$=CHR$(94) THEN CE=CE-1
720 IF A$=CHR$(10) THEN CE=CE+1
730 IF A$=CHR$(8) THEN CD=CD-1
740 IF A$=CHR$(9) THEN CD=CD+1
750 IF CD<15 THEN CD=46
760 IF CD>46 THEN CD=15
770 IF CE<7 THEN CE=22
780 IF CE>22 THEN CE=7
790 GOTO 560
800 GOTO 60
810 REM SWITCH MODES
820 IF FL=1 THEN FL=0:P=0:RETURN
830 FL=1
840 PRINT@0,"SWITCH TO <S> OR <R
>ESET       ";
850 B$=INKEY$
860 IF B$="" THEN 850
870 IF B$="S" THEN P=1:RETURN
880 IF B$="R" THEN P=2:RETURN
890 GOTO 850
900 REM CLEAR SCREEN
910 PRINT@0,"CLEAR SCREEN (Y/N)"
920 B$=INKEY$
930 IF B$=""THEN 920
940 IF B$="Y" THEN COLOR 0,1:LIN
E(T,U)-(T+31,U+15),PSET,BF:COLOR
 1,0:GOTO 970
950 IF B$="N" THEN 540
960 GOTO 920
970 FOR XI=103 TO 359 STEP 32
980 PRINT@XI,STRING$(17,128);
990 NEXT XI:RETURN
1000 REM GET PICTURE
1010 PRINT@0,"GET WHICH PICTURE
";
1020 INPUT AC$:V=VAL(AC$)
1030 IF V<1 OR V>96 THEN 1010
```



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```
1040 GOSUB 1580
1050 PMODE 4,5
1060 GET(X,Y)-(X+31,Y+15),S,G
1070 PMODE 4,1
1080 PUT(T,U)-(T+31,U+15),S,PSET
1090 GOTO 440
1100 REM SEE HI-RES SCREEN
1110 PMODE 4,1
1120 SCREEN 1,1
1130 IF INKEY$="" THEN 1130
1140 PMODE 4,5
1150 SCREEN 1,1
1160 IF INKEY$="" THEN 1160
1170 PMODE 4,1
1180 SCREEN 0,0
1190 RETURN
1200 REM SAVE AND QUIT
1210 GOSUB 1580
1220 GET(T,U)-(T+31,U+15),S,G
1230 PMODE 4,5
1240 PUT(X,Y)-(X+31,Y+15),S,PSET
1250 PMODE 4,1
1260 GOTO 60
1270 REM SHOW ANIMATION
1280 SCREEN 1,1
1290 RJ=1
1300 FOR X=0 TO 255 STEP 32
1310 FOR Y=0 TO 191 STEP 16
1320 PMODE 4,5
1330 GET(X,Y)-(X+31,Y+15),S,G
1340 PMODE 4,1
1350 PUT(T(RJ,1),T(RJ,2))-(T(RJ,
1)+31,T(RJ,2)+15),S,PSET
1360 RJ=RJ+1
1370 IF PEEK(339)=251 THEN 60
1380 IF PEEK(345)=247 THEN 1390
ELSE 1370
1390 NEXT Y,X
1400 GOTO 60
1410 END
1420 GOTO 60
1430 REM END PROGRAM
1440 CLS
1450 Y=1
1460 FOR X=1024 TO 1215 STEP 2
1470 POKE X,T(Y,1)
1480 POKE X+1,T(Y,2)
1490 Y=Y+1
1500 NEXT X
1510 PRINT@480,"     SAVE ON (T)AP
E OR (D)ISK";
1520 A$=INKEY$:IF A$="" THEN 152
0
1530 PRINT@480,"
                 ";
1540 IF A$="D" THEN 1650
1550 IF A$="T" THEN 1720
1560 SOUND 1,1:GOTO 1510
```

```
1570 GOTO 60
1580 REM FIND AREA FOR PICTURE
1590 VA=0
1600 FOR X=0 TO 255 STEP 32
1610 FOR Y=0 TO 191 STEP 16
1620 VA=VA+1
1630 IF VA=V THEN RETURN
1640 NEXT Y,X
1650 REM SAVE INFO ON DISK
1660 PRINT@416,"NAME";:INPUT N$
1670 N$=LEFT$(N$,7)
1680 SAVEM N$,9728,15871,0
1690 N$=N$+"2"
1700 SAVEM N$,1024,1215,0
1710 GOTO 60
1720 REM LOAD FROM TAPE
1730 PRINT@416,"NAME";:INPUT N$
1740 N$=LEFT$(N$,7)
1750 PRINT@416,"POSITION TAPE AN
D PRESS ANY KEY.";
1760 IF INKEY$="" THEN 1760
1770 CSAVEM N$,7680,13823,0
1780 N$=N$+"2"
1790 CSAVEM N$,1024,1215,0
1800 GOTO 60
1810 REM LOAD PICTURE
1820 CLS
1830 INPUT"NAME ";N$
1840 N$=LEFT$(N$,7)
1850 CLS:PRINT@224,"LOAD FROM (T
)APE OR (D)ISK?"
1860 A$=INKEY$:IF A$="" THEN 186
0
1870 IF A$="D" THEN 1900
1880 IF A$="T" THEN 2000
1890 SOUND 1,1:GOTO 1850
1900 LOADM N$
1910 N$=N$+"2"
1920 LOADM N$
1930 Y=1
1940 FOR X=1024 TO 1215 STEP 2
1950 T(Y,1)=PEEK(X)
1960 T(Y,2)=PEEK(X+1)
1970 Y=Y+1
1980 NEXT X
1990 GOTO 60
2000 CLS:PRINT@224,"POSITION TAP
E AND PRESS ANY KEY."
2010 IF INKEY$="" THEN 2010
2020 CLOADM N$
2030 N$=N$+"2"
2040 CLOADM N$
2050 Y=1
2060 FOR X=1024 TO 1215 STEP 2
2070 T(Y,1)=PEEK(X)
2080 T(Y,2)=PEEK(X+1)
2090 Y=Y+1
2100 NEXT X
2110 GOTO 60
2120 CLS:END
```

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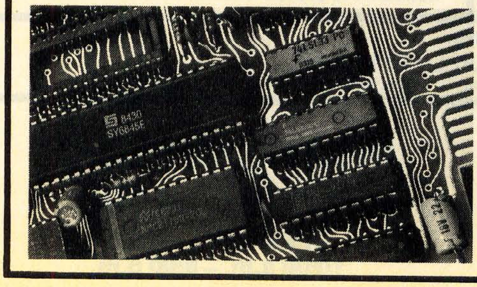

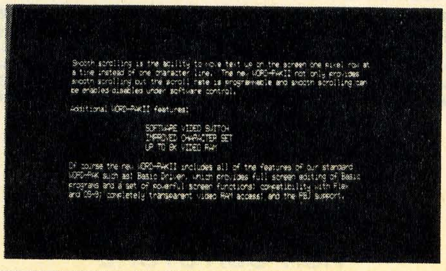

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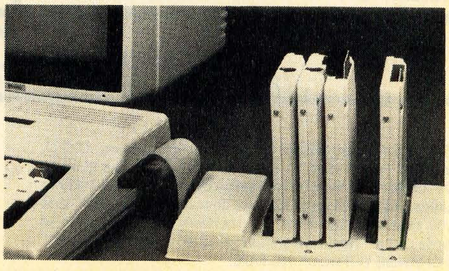

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In the tradition of good guy/bad guy conflicts . . .

By David Billen

Want great sound without sacrificing fast graphics? *Zonx* provides you with both! It proves that, without a doubt, the CoCo can produce sound without slowing the action, and as an added bonus, *Zonx* is fun!

To play *Zonx*, enter and run the program listing. If you have Extended BASIC, begin by typing `PCLEAR 1`. After you type `RUN`, the program begins reading the `DATA` statements and poking the numbers into memory. These numbers make up a machine language program. After all the numbers are poked, the BASIC programs will save the machine language program to tape. You can load this program by typing `CLOADM` and run it by typing `EXEC`. Before testing *Zonx*, be sure to save the BASIC program that created it just in case you make a typing error and it does not work.

Once the program is up and running the first thing you see is a title screen. At this point, *Zonx* also plays a little heavy metal rock-and-roll music while waiting for you to press the right joystick button.

The game begins and your joystick controls a ship that moves right or left near the bottom of the screen. The ship will not stay still — something to do with gravitational photon intervention.

Two different types of characters will fly down the screen, "Zonxes" and "Zugs." Zonxes are the ones that flash; Zugs are the sluggy-looking things. A Zonx will not harm you, but if you can touch it with the very tip of your ship, the game will have a brief "spasm" and 100 points are rewarded. Conflict with a Zug is always fatal and, since the goal is to earn points, I suggest avoiding them.

You will encounter a wave of Zonxes, a wave of Zugs and a wave of both. If you survive this far, bonus points are awarded and the level of difficulty increases. After the fourth increase in difficulty the game never gets any harder. If you make it that far, you are doing incredibly!

I welcome correspondence from those who have questions or comments. My address is P.O. Box 832, Edmond, OK 73083. Please include an SASE.

Good luck, it's all in the wrist! ☐

(David Billen is a self-employeed programmer. His hobby is music synthesis, ranging from his CoCo to Syncho drums.)

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Editor's Note: As we were going to press, David Billen advised us that four POKEs will be needed to correct a problem that has arisen on some CoCos. You can type in the following line and CSAVE it on tape before the *Zonx* ML program; to play the game, simply load this program (leave the Play button down on your recorder) and run it. After the four POKEs have been made, the ML program will be loaded and executed automatically.

```
10 CLS:PRINT@264,"LOADING zonx..
.":POKE359,127:POKE360,255:POKE3
61,34:POKE362,57:CLOADM"ZONX":EX
EC
```

If you want to use the *Zonx* program on disk, change CLOADM in this loader program to LOADM. Since the following listing will not run on a disk system, run it with the controller unplugged and save the machine language on tape, then CLOADM it into your disk system later and type SAVEM "ZONX",13740,16383,13744 and press ENTER.

150	104	890	19
310	74	1030	41
440	106	1170	123
600	255	1300	166
750	26	END	238

The listing: ZONX

```
10 CLEAR 200,13700
15 CLS:PRINT:PRINT"LOADING MACHI
NE CODE..."
20 X=13744
30 READ A:IF A<>999 THEN POKE X,
A:X=X+1:GOTO 30
35 FOR X=15872 TO 16383:POKE X,0
:NEXT
50 T=6:FOR X=15891 TO 15905 STEP
 2:POKE X,T:POKE X+1,RND(255):T=
T+1:NEXT X:POKE 15907,13:POKE 15
908,RND(255)
60 PRINT:INPUT "READY RECORDER/P
RESS ENTER";A$
70 CSAVEM "ZONX",13740,16383,137
44
80 END
100 DATA 134,85,183,0,113,142,53
,187,191,0,114,18,134,62,31,139
110 DATA 142,53,218,191,1,13,134
,53,183,255,3,28,239,189,169,118
120 DATA 16,223,10,16,206,63,255
,126,56,162,182,255,2,12,0,59
130 DATA 13,12,16,38,1,191,182,2
55,32,31,137,132,3,138,128,183
140 DATA 255,32,182,255,0,247,25
5,32,214,18,132,128,38,3,90,42
150 DATA 7,92,193,62,35,2,214,18
,215,1,142,12,64,214,18,84
160 DATA 58,236,132,221,14,134,8
,16,142,0,0,16,175,132,48,136
170 DATA 32,74,38,247,134,255,15
1,8,142,12,64,214,1,215,18,84
180 DATA 58,37,46,15,15,134,24,1
48,8,167,136,32,134,60,148,8
190 DATA 167,136,64,167,136,96,1
34,219,148,8,167,137,0,128,167,1
37
200 DATA 0,160,167,137,0,192,134
,195,148,8,167,137,0,224,126,54
210 DATA 214,204,1,128,148,8,212
,8,237,136,32,204,3,192,148,8
220 DATA 212,8,237,136,64,237,13
```

One-Liner Contest Winner . . .

Type this One-Liner in and you've added another "peripheral" to your CoCo system! (You may have to EDIT the line to get it all in.)

The listing:

```
10 V=90:PMODE4:SCREEN1,1:PCLS:DR
AW"BM50,120U12E10R40G10D12NL40M+
20,-6U20NM-10,+3L40M-10,+3DR5G10
D4R30U4E12L30M-4,+15":PAINT(68,9
9),1,1:FORX=75TO220STEP.3:Y=SIN(
X/5)*15+V:LINE(X-10,Y)-(X+20,Y),
PSET:V=V-.14:IFX>108THENPRESET(X
-10,Y+14.4):NEXT:RUNELSENEXT
```

Russ Rowgo
Kalamazoo, MI

(For this winning one-liner entry, the author has been sent copies of *The Rainbow Book Of Simulations* and its companion *Rainbow Simulations Tape*.)

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```
6,96,204,13,176,148,8,212,8,237
230 DATA 137,0,128,237,137,0,160
,237,137,0,192,204,12,48,148,8
240 DATA 212,8,237,137,0,224,220
,14,132,15,196,240,221,14,126,54
250 DATA 214,222,4,166,192,17,13
1,192,0,37,3,206,160,0,223,4
260 DATA 57,142,62,19,16,174,132
,111,164,49,168,32,16,140,14,0
270 DATA 37,11,189,54,161,132,31
,16,142,4,0,49,166,16,175,129
280 DATA 140,62,37,37,223,57,142
,62,19,134,3,167,145,140,62,37
290 DATA 37,249,13,13,16,38,5,98
,57,13,16,38,15,142,62,37
300 DATA 111,129,140,62,53,37,24
9,12,16,15,73,57,142,62,37,189
310 DATA 55,82,38,42,167,164,167
,168,32,49,168,64,16,140,13,64
320 DATA 37,11,167,164,167,168,3
2,16,142,0,0,32,17,134,60,167
330 DATA 164,148,7,167,168,96,15
0,7,167,168,32,167,168,64,16,175
340 DATA 129,156,53,16,37,255,20
0,150,6,76,132,3,151,6,38,17
350 DATA 150,7,129,255,38,4,134,
85,32,5,72,36,2,134,255,151
360 DATA 7,57,16,174,132,16,140,
1,0,34,23,189,54,161,132,127
370 DATA 145,81,44,16,189,54,161
,132,31,16,142,4,0,49,166,16
380 DATA 175,132,79,57,134,255,5
7,134,255,151,0,150,73,42,2,19
390 DATA 57,16,38,0,95,214,74,92
,196,63,215,74,150,77,92,141
400 DATA 7,79,214,74,141,2,32,23
7,183,255,32,13,0,42,4,90
410 DATA 38,249,57,53,192,150,12
,129,1,38,17,151,73,76,151,12
420 DATA 134,232,183,255,34,19,1
34,248,183,255,34,57,76,38,8,16
430 DATA 206,63,255,126,56,162,5
7,151,12,134,248,183,255,34,142,
12
440 DATA 64,214,18,189,54,161,12
9,5,34,5,134,232,183,255,34,151
450 DATA 8,126,54,47,129,1,16,38
,0,143,150,12,31,137,64,151
460 DATA 1,189,54,161,148,1,189,
55,152,32,239,13,17,38,18,142
470 DATA 62,55,111,129,156,71,37
,250,12,17,134,2,151,73,151,76
480 DATA 57,142,62,55,189,55,82,
38,86,167,164,167,168,32,49,168
490 DATA 64,16,140,13,64,37,25,1
67,164,167,168,32,167,168,64,167
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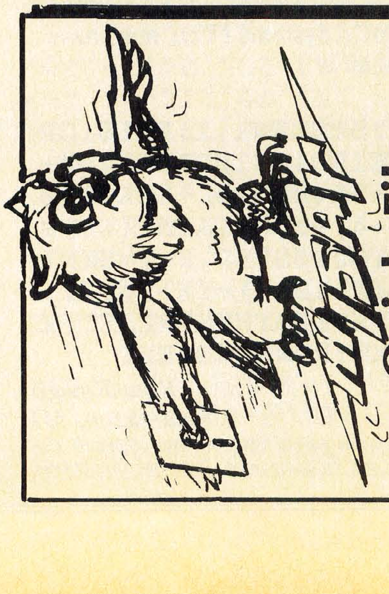

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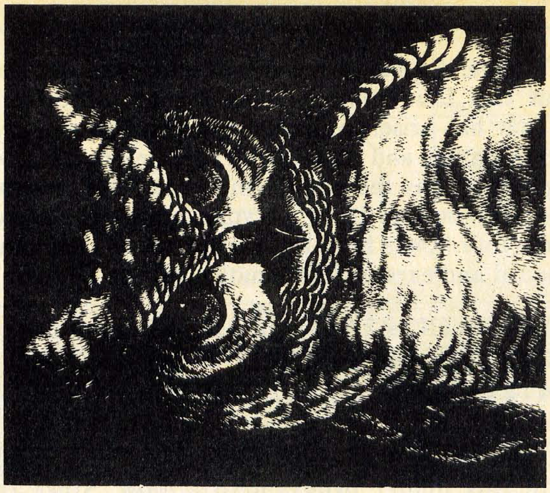

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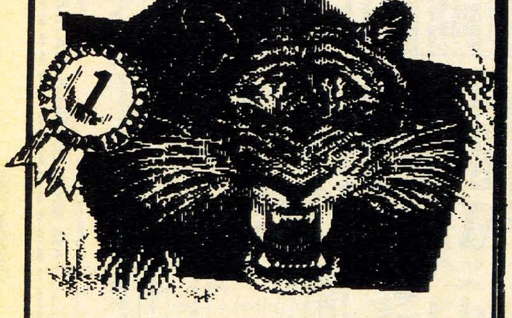

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500 DATA 168,96,167,169,0,128,16
7,169,0,160,16,142,0,0,32,47
510 DATA 206,56,148,150,9,76,132
,15,151,9,150,17,13,9,38,7
520 DATA 76,129,5,37,2,134,1,151
,17,74,72,51,198,16,159,1
530 DATA 198,8,166,192,167,164,4
9,168,32,90,38,246,16,158,1,16
540 DATA 175,129,156,71,16,37,25
5,156,57,129,2,16,38,1,211,214
550 DATA 74,90,90,196,127,215,74
,150,77,189,55,152,79,214,74,189
560 DATA 55,152,32,235,24,36,24,
66,24,129,24,66,24,36,24,66
570 DATA 24,129,189,56,222,142,6
2,82,134,4,111,134,74,42,251,151
580 DATA 7,151,73,151,77,142,62,
12,76,167,128,140,62,19,37,249
590 DATA 142,160,0,159,4,126,58,
21,79,31,139,16,191,0,136,32
600 DATA 4,173,159,160,2,166,128
,38,248,134,62,31,139,57,142,255
610 DATA 192,111,132,111,2,111,4
,142,62,82,16,142,62,87,95,166
620 DATA 165,161,133,34,16,37,5,
92,193,5,37,243,198,5,166,133
630 DATA 167,165,90,42,249,142,4
,0,134,96,167,128,140,6,0,37
640 DATA 249,16,142,4,32,142,58,
126,189,56,200,16,142,4,96,189
650 DATA 56,200,16,142,4,203,189
,56,200,142,62,82,16,142,4,237
660 DATA 141,25,142,62,87,16,142
,5,45,141,16,142,4,0,166,132
670 DATA 136,64,167,128,140,6,0,
37,245,32,31,95,16,191,0,136
680 DATA 31,155,166,133,139,48,1
73,159,160,2,92,193,5,37,243,134
690 DATA 48,173,159,160,2,134,62
,31,139,57,182,255,0,132,1,39
700 DATA 249,126,59,75,142,54,23
3,159,79,15,16,79,151,81,151,12
710 DATA 167,226,68,151,77,189,5
5,119,189,54,177,189,53,224,173,
159
720 DATA 62,79,166,224,76,38,233
,142,6,0,150,78,151,81,175,227
730 DATA 189,55,119,189,54,177,1
89,53,224,13,12,38,20,220,14,39
740 DATA 16,132,102,196,102,16,1
31,0,0,39,4,12,13,32,2,12
750 DATA 12,173,159,62,79,174,22
5,48,31,38,211,79,151,81,167,226
760 DATA 68,151,77,189,55,119,18
9,54,177,189,53,224,173,159,62,7
9
770 DATA 166,224,74,38,233,57,14
2,55,251,159,79,15,17,126,57,123
780 DATA 142,58,0,159,79,15,17,1
5,16,15,74,15,75,126,57,123
790 DATA 189,54,233,189,55,251,1
3,12,38,10,13,13,38,6,134,3
800 DATA 151,73,151,76,57,134,1,
151,78,189,61,21,189,61,138,142
810 DATA 62,37,150,78,139,3,72,4
8,134,159,53,142,62,55,48,134
820 DATA 159,71,189,57,116,189,5
7,230,189,57,240,189,59,217,134,
255
830 DATA 151,7,189,61,138,150,78
,76,151,78,129,5,37,209,10,78
840 DATA 32,205,129,3,16,38,2,38
,214,74,92,196,63,215,74,38
850 DATA 9,214,75,90,39,4,196,12
7,215,75,214,75,219,74,150,77
860 DATA 72,189,55,152,214,74,21
9,75,79,189,55,152,32,218,32,32
870 DATA 32,32,32,32,32,32,32,32
,60,60,40,40,90,79,78,88
880 DATA 41,41,62,62,0,32,32,32,
32,32,32,32,32,66,89,32
890 DATA 68,65,86,73,68,32,66,73
,76,76,69,78,13,32,32,32
900 DATA 32,32,80,82,69,83,83,32
,66,85,84,84,79,78,32,84
910 DATA 79,32,66,69,71,73,78,0,
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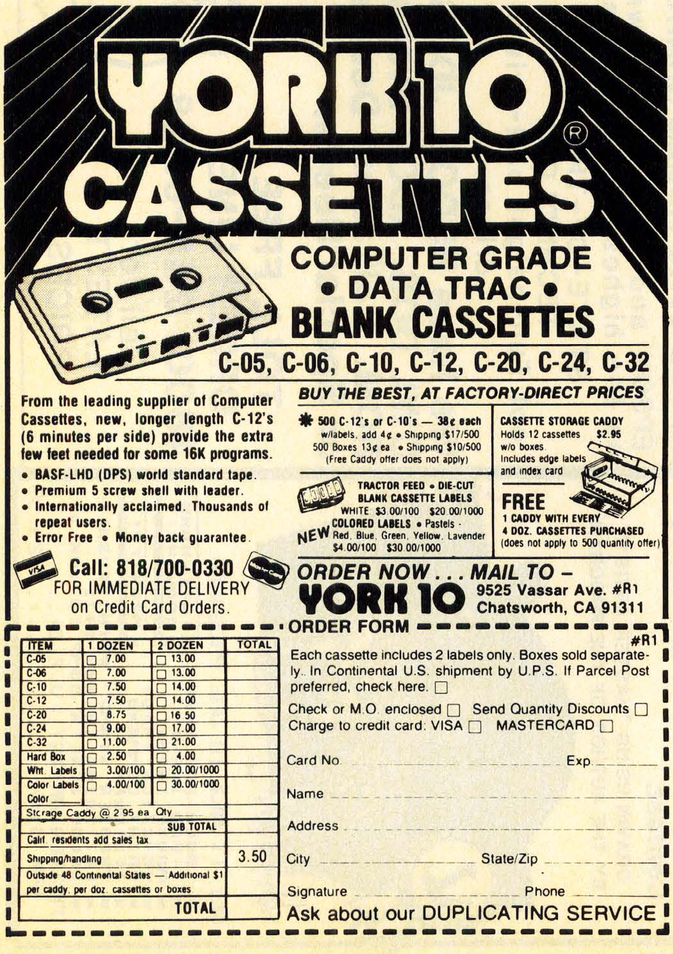

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920 DATA 82,69,13,13,32,32,32,32
,32,32,32,32,32,32,32,72
930 DATA 73,71,72,32,83,67,79,82
,69,0,151,1,151,2,215,3
940 DATA 134,252,151,77,15,0,134
,4,167,226,150,77,214,1,141,64
950 DATA 79,214,1,141,59,106,228
,38,241,134,4,167,228,150,77,214
960 DATA 2,141,45,79,214,2,141,4
0,106,228,38,241,166,224,150,0
970 DATA 145,3,36,38,150,77,39,3
,74,151,77,150,1,129,255,39
980 DATA 3,76,151,1,150,2,129,1,
39,3,74,151,2,126,58,246
990 DATA 183,255,32,90,18,18,18,
18,38,249,57,142,59,133,166,128
1000 DATA 39,249,230,128,129,1,3
8,18,16,142,4,46,166,164,138,64
1010 DATA 167,160,16,140,4,50,37
,244,134,1,189,58,234,16,142,4
1020 DATA 46,166,164,132,191,167
,160,16,140,4,50,37,244,182,255,
0
1030 DATA 133,1,38,202,57,80,16,
16,16,1,16,32,32,16,16,1
1040 DATA 16,80,16,80,16,16,16,1
,16,32,32,16,16,1,16,80
1050 DATA 16,64,32,1,16,64,16,64
,32,1,16,48,16,64,32,1
1060 DATA 16,64,16,64,32,1,16,48
,16,80,16,16,16,1,16,32
1070 DATA 32,16,16,1,16,80,16,80
,16,16,16,1,16,16,16,16
1080 DATA 16,16,16,1,16,1,16,0,0
,134,10,214,78,61,231,226
1090 DATA 166,228,198,8,189,58,2
34,189,60,162,189,60,182,189,55,
64
1100 DATA 189,61,138,106,228,38,
233,53,2,142,60,20,166,128,16,39
1110 DATA 255,72,68,230,128,189,
58,234,52,16,189,55,64,189,61,13
8
1120 DATA 53,16,32,232,1,255,144
,32,144,32,144,32,144,32,144,16
1130 DATA 128,48,144,16,128,48,1
44,16,128,16,80,16,96,32,80,16
1140 DATA 80,16,80,16,144,16,128
,16,2,32,144,16,128,16,2,32
1150 DATA 144,16,128,16,80,16,96
,144,0,0,150,13,129,1,38,21
1160 DATA 150,73,151,76,134,4,15
1,73,151,13,134,232,183,255,34,1
89
1170 DATA 60,162,126,60,182,150,
13,139,64,151,13,36,16,15,13,204
1180 DATA 0,0,221,14,150,76,151,
73,134,248,183,255,34,57,129,4
1190 DATA 16,38,250,251,150,13,6
4,72,138,128,214,13,189,55,152,7
9
1200 DATA 214,13,189,55,152,32,2
37,150,86,76,151,86,129,10,37,21
1210 DATA 15,86,142,62,82,198,3,
166,133,76,167,133,129,10,37,5
1220 DATA 111,133,90,42,242,57,1
42,62,82,198,4,16,142,15,112,166
1230 DATA 133,206,60,227,72,72,1
71,133,51,198,134,5,151,1,16,159
1240 DATA 2,166,192,167,165,49,1
68,32,10,1,38,245,16,158,2,90
1250 DATA 42,221,57,3,51,51,51,3
,15,207,207,207,3,3,243,3
1260 DATA 63,3,3,243,195,243,3,5
1,51,3,243,243,3,63,3,243
1270 DATA 3,3,63,3,51,3,3,243,24
3,243,243,3,51,3,51,3
1280 DATA 3,51,3,243,243,142,4,0
,111,128,140,14,0,37,249,134
1290 DATA 255,167,128,140,16,0,3
7,249,142,255,192,111,0,111,2,11
1
1300 DATA 5,134,248,183,255,34,1
6,142,15,113,142,62,82,198,4,189
1310 DATA 60,191,189,60,182,142,
61,113,16,142,15,111,16,159,1,16
1320 DATA 142,15,106,189,61,87,5
7,52,32,198,5,166,128,152,7,167
1330 DATA 164,49,168,32,90,38,24
4,53,32,49,33,16,156,1,38,231
1340 DATA 57,60,192,48,12,240,60
,192,192,192,60,48,204,204,204,4
8
1350 DATA 240,204,240,204,204,25
2,192,240,192,252,142,61,210,16,
142,14
1360 DATA 44,52,32,198,8,215,6,1
66,128,141,42,215,3,141,38,150
1370 DATA 3,221,1,68,84,154,1,21
8,2,148,7,212,7,136,255,200
1380 DATA 255,237,164,49,168,32,
10,6,38,221,53,32,49,34,16,140
1390 DATA 14,52,37,205,57,198,4,
215,1,95,72,89,89,10,1,38
1400 DATA 249,57,254,4,8,16,32,6
4,128,254,124,130,130,130,130,13
0
1410 DATA 130,124,130,130,162,14
6,146,138,130,130,130,130,68,40,
40,68
1420 DATA 130,130,65,82,48,50,54
,180,150,83,84,65,82,48,52,54
1430 DATA 205,134,83,84,65,82,88
,50,54,219,148,76,73,70,69,60
1440 DATA 999
1450 DATA 6,161,7,24,8,154,9,17,
10,238,11,16,12,1,13,62,13,153,9
99
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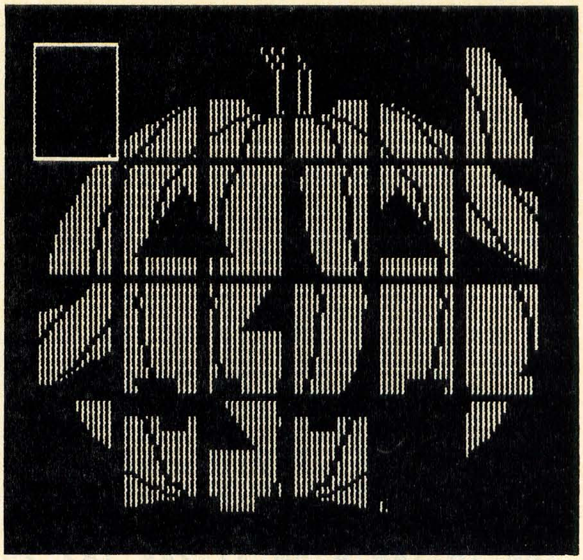
WISHING WELL

32K ECB

Have a little Halloween fun with . . .

The CoCo Puzzle Maker



By Fred B. Scerbo
Rainbow Contributing Editor

Editor's Note: If you have an idea for the "Wishing Well," submit it to Fred c/o THE RAINBOW. Remember, keep your ideas specific, and don't forget that this is BASIC. All programs resulting from your wishes are for your use but remain the property of the author.

Four years ago, back when THE RAINBOW was still a photocopy publication of about a dozen or so pages, I submitted my first program to Lonnie Falk for use in his new publishing venture. The program, *Zelda's Bat Bottle*, was a simple arcade-style graphics game with a Halloween theme. Bats would circle above a witch's boiling kettle while she tried to zap them into her bottle with bolts from her magic wand.

Fortunately, that game was the start of a very long friendship I have enjoyed with THE RAINBOW staff, although our contacts are usually restricted to phone conversations or a RAINBOWfest encounter. Now, some four years down the road, "Wishing Well" is in full swing on a monthly basis, and I am still having as much fun creating new programs as I was with the original *Zelda* game.

With all this in mind, the thought occurred to me that it might be time to create another Halloween game for the October issue. I toyed for a few days with the concept of creating a game called *Peter, Peter, Pumpkin Eater*, but no matter how hard I tried, the program kept looking too much like *Pac-Man* or my own *Snail's Revenge*. Some ideas even surfaced for *Zelda II*, but none seemed to catch my fancy. Over and over again, I kept coming back to the idea of doing something with a pumpkin, while at the same time not making it something limited to the month of October only. Deadline was approaching; what could I do?

(Fred Scerbo is a special needs instructor for the North Adams Public Schools. He holds a master's in education and has published some of the first software available for the Color Computer through his software firm, Illustrated Memory Banks.)

The Wish

I took another look over my recent mail. A consistent pattern was always visible: People liked games, but they also like programs that could teach something. Most of all, readers indicated that they usually got the most out of programs they could alter, with my instructions, to include things they would create. After much thought, I came up with a program that would include all of this and still fit into my plans for a special Halloween program. The result is the *CoCo Puzzle Maker*, written for 32K Extended Color BASIC.

The Program

Like a puzzle you would buy in a box or find printed in the pages of a magazine, *CoCo Puzzle Maker* jumbles an image on the screen that the user must reassemble. To fit the Halloween spirit, the image I have chosen is a bright, smiling jack-o'-lantern. Every time the program is run, the puzzle will be jumbled in a different way. Each square of the puzzle on the grid will at some point be surrounded by a flashing square. The square may be moved around the screen using the right- and left-arrow keys on the keyboard.

When the flashing box surrounds a piece you wish to move, press the ENTER key and the image in the box will vanish. Use the keys to position the square over another section where you may want to put the piece selected. Position it where you wish and press ENTER again. That piece will vanish and then the two pieces will have exchanged places.

Continue to move pieces around the screen until you have assembled the image the way it should look. When the puzzle is complete, press the letter 'S' and the screen will clear and tell you how many minutes it took to complete the puzzle.

At this point you may either press 'P' to view the puzzle picture without the grid lines, or press 'R' to run the program again and try for a better time. When you view the completed puzzle, pressing ENTER will return to the text menu.

Sound simple? Well, while the concept is simple, you will be amazed at how tricky it is to complete the puzzle quickly. On first running the program, you will notice the screen is either red or blue. If the screen is not red, press Reset and run again until the screen is red. When it is red, press ENTER to start the program. (I used this method rather than the type used in last month's column since some of you may wish to use your own graphics for the puzzle and this is a more consistent method to use.)

Creating Your Own

Here's where the beauty of *CoCo Puzzle Maker* comes in. I have left considerable space between the start of the program and the actual puzzle routines for you to draw your own picture to use within the puzzle. Those who have *Graphicom*, *CoCo Max* or one of the other graphics programs available could also use graphics created with these and merge them with *Puzzle Maker* according to whatever instructions those programs give to merge your graphics with BASIC programs.

Let's say you simply wish to draw graphics using Extended Color BASIC commands. In that case, place your lines between the numbers 200 and 1999 for the drawing. You may delete my graphics by typing `DEL210-1999` and pressing ENTER. Now, enter the following lines to create a concentric circle puzzle:

```
210 CLS0:PMODE4,1:PCLS0:SCREEN0,0
220 FORI=1 TO 100 STEP8
230 CIRCLE(128,96),I,1,.9
240 NEXTI
```

Believe it or not, the puzzle you create with these few lines will be very challenging to solve. Even I have had difficulty with it, so if you try it, you will see that this program can be for almost any age level, depending on how difficult the design is. If you really want it to be a challenge, change Line 220 to this:

```
220 FORI=1 TO 200 STEP4
```

That will really make the puzzle tough.

If you want to draw a simple design, try drawing the image outside the program starting with Line 210. To get an idea of the area the drawing should remain within, you may first wish to draw a box using the `LINE` command with the dimmensions:

```
LINE(32,32)-(224,160),PRESET,B
```
or
```
LINE(32,32)-(224,160),PSET,B
```

This gives you a square to draw your image within which the shape of the puzzle will fit.

I chose not to use the full screen since some of you may make drawings which would leave too much blank space for the puzzle pieces. Also, some of the available graphics programs do not fill the whole screen because they use a border for the colors and keyboard commands. I think you will find this size fits those programs very well, but you will have to do the experimenting; I do not have any of those commercially available programs at my disposal. Judging from the artwork that has been submitted to the "CoCo Gallery," I am sure you will come up with some outstanding puzzle graphics. Please refer to the instructions of your graphics program to determine how to merge with other BASIC programs.

Conclusion and a Few More Points

You may now wonder what is educational about this. I firmly believe that using puzzles helps young students with logic skills. Molding this with the computer keyboard is only bound to help with those skills.

You will also notice the program does not tell if the completed picture is correct. Pressing 'S' only tells how much time it took to complete, not whether or not you got the picture done correctly. Adding that feature would have made the program a bit too long. As it is, I regret that I couldn't crunch this down into 16K, but it may give some of you an incentive to upgrade.

Also, be patient while the program draws the puzzle picture. It may take as long as a minute, but the program is working. Until next month, enjoy the pumpkin puzzle. Happy Halloween! ☐

	2390 206
100 51	2560 63
270 125	2670 194
2100 49	2850 55
2260 105	END 111

The listing: PUZLMAKR

```
1 '******************************
2 '*  THE CO-CO PUZZLE MAKER    *
3 '*     BY FRED B. SCERBO      *
4 '*149 BARBOUR ST.,N.ADAMS,MA*
5 '*   COPYRIGHT (C)  1985    *
6 '******************************
10 PMODE4,1:PCLS0:SCREEN1,1:PMOD
E3:PCLS3
20 IFINKEY$<>CHR$(13)THEN20
30 SCREEN0,0:CLS0:POKE1070,20:PO
KE1071,8:POKE1072,5:FORI=1120TO1
311:READ A:POKEI,A+128:NEXT
40 PRINT@358," BY FRED B.SCERBO
 ";
```

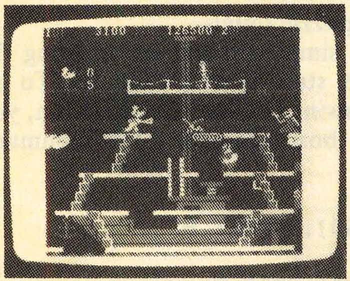
GAMES

THE SAILOR MAN

TAPE $29.95
DISK $34.95

The first screen objective is to catch enough of Elsie's kisses (those Red Heart Shaped Things) to fill in the squares on the Sailorman's house. If you can time your punch just so, you can send the punching bag over to knock the bucket down and, with a little bit of luck, right on **Bigfatbadguy's** head. This will give you a little (but not much) time to catch all those RHSTs.

You must avoid contact with **Bigfatbadguy** who is actively pursuing you. You must also be careful of **Olduglyseawoman** who will appear at higher difficulty levels to chuck empties at you. Either avoid the flying bottles or punch them (with the fire button) to keep from being knocked into the water.

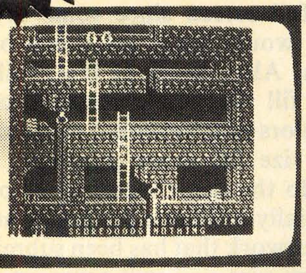


The second screen objective is to collect enough notes to play Elsie a little love song. You may jump off and onto the other end of **Fatguyeatinghamburger's** teetertotter to fly up a deck and even two decks if you manage to catch hold of **Smartaleckkid's** grab handles. Time it right and away you go.

The Third screen objective is to collect enough letters (thrown by Elsie's cries for H-E-L-P) to complete a ladder all the way to the crow's nest where Elsie is calling you. Beware of the Crow, however, who thinks you are after her eggs!

On all screens, eating a can of collard greens (labeled "S" for Collard and grasped by punching the can just right) will give you amazing speed, strength and ability and allow you to send **Bigfatbadguy** into the drink with a single punch.

NEW! DRAGON SLAYER



Save the villagers of Pendor! They live in fear of Icarus, the blood thirsty dragon. The dragon lives in a cave, way up in the mountains. The cave is a treasure chest, full of gems and cashbags. The trail to the cave is as menacing as Icarus himself. You will have to secure the necessary equipment to climb the rocks and cross the rivers and chasms along the way. Be on the lookout for enemies and barriers at all times.

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SPACE SHUTTLE	$28.95	$31.95
FROG	$27.95	$30.95
CHAMBERS	$24.95	$27.95
TRAPFALL	$27.95	$30.95
KATER PILLAR II	$24.95	$27.95
WAREHOUSE MUTANTS	$24.95	$27.95

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NEW! EDUCATIONAL

FACTPACK

FACTPACK is a set of 3 programs designed for home or school use. The programs provide drill and practice with basic addition, subtraction, multiplication and division facts and are appropriate in grades 1-6. Each program requires a 32K Extended BASIC Color Computer. Disk drive and printer are optional.

Requires 32 K Ext. Basic Tape $24.95 Disk $29.95

TEACHER'S DATABASE II

Teachers' Database (TDB) is a program designed to allow a teacher to keep a computerized file of information about his/her students.

The program requires a 64K Color Computer and at least one disk drive. This completely revised program includes all of the capabilities of the original TDB plus many new features.

- Information on as many as 100 students, or more, may be in the computer at one time.
- Each student may have as many as 20, or more, individual items of data in his/her record.
- The program has many easy to follow menus.
- Records may be easily changed, deleted, or combined.
- Information about students may be numerical or text.
- Records may be quickly alphabetized or reordered based on their contents.
- Records may be sored by various criteria.
- A full statistical analysis of scores may be done and sent to the printer.
- Student test scores may be weighted, averaged, changed to a percentage or changed to a letter grade.
- Individual student progress reports and class gradebook sheets may be printed.
- Three methods of data entry spped the task of typing in student grades and test results.
- The program may be easily customized to work with any printer.
- Student seating charts may be created and printed.
- Graphs of student test results may be created using the computer's high resolution graphic screen.
- Grade distribution can be displayed numerically or as a histogram.

Requires 32K Ext. Basic Tape $39.95 Disk $42.95

VOCABULARY MANAGEMENT

Requires 16K Ext. Basic or 32K for printer output.

The Vocabulary Management System (VMS) is a series of programs designed to aid a parent or teacher in helping children to learn and practice using vocabulary and spelling words. The 11 programs that comprise the VMS include a full feature data entry/edit program, three printer output programs and 5 vocabulary/spelling game programs. The system's many outstanding features include:

- As many as 300 vocabulary words and definitions may be in the computer's memory at one time.
- Words and definitions may be saved on disk or tape.
- Remarks and/or comments can be saved with word files.
- A disk loading menu allows students to load disk files without typing file names.
- Word lists may be quickly alphabetized.
- The three printer segments allow you to create and print individualized tests, puzzles, word-searches and worksheets.
- The printer segments allow full use of your printer's special features.
- The 5 game programs are based on sound educational principles and provide practice in identifying words and matching them with their definitions in a fast-paced set of activities.

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5. Review converting mixed numerals to mixed numerals. (Used in regrouping in substraction).
6. Practice converting mixed numerals to mixed numerals.

EQUIVALENCE

1. Definitions of terms and review of finding equivalent fractions.
2. Practice finding equivalent fractions.
3. Practice finding sets of equivalent fractions.
4. Review of dinding if one fraction is equal to, not equal to, less than or greater than another.

LOWEST TERMS

1. Review of placing fractions into lowest terms by dinding the greatest comon factor (GCF) of the numerator and denominator.
2. Practice finding the GCF of pairs of numbers.
3. Practice placing fractions into lowest terms by finding the GCF of the numerator and denominator.

32K EXT BASIC TAPE $30.95 DISK $35.95

MATH DUEL

MATH DUEL is a challenging mathematics game that pits you against the computer in a game of wits. You must use all of your knowledge of factors, multiples and prime numbers to develop a strategy that allows you tog ather more numbers and thus more points than the computer.

The game is deceptively simple. you select the size of the playing field that is composed of from 8 to 100 numbers. You must then choose numbers that will give you the maximum number of points and the computer the least number of points. There are only 6 rules.

32K EXT. BASIC TAPE$24.95 DISK $29.95

SIMULATIONS

P51 Mustang
Attack Flight
Simulator
JUST IMAGINE! Your movements are shown at any remote CoCo across town or across the country. It's hard to believe it's simulation.
P40 shown.

P51 Mustang

Attack Flight Simulator

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32K Machine Language Tape $29.95 Disk $34.95 Cable $10.95

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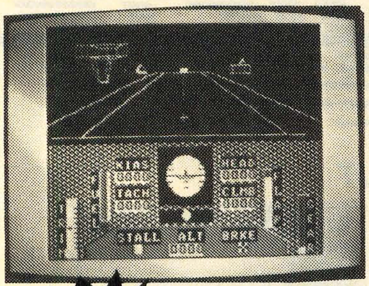
C.L. - "As a pilot I found "Flight" to be an outstanding simulation".

WORLDS OF FLIGHT (WOF) is a "view" oriented flight simulation for the TRS-80 Color Computer, written entirely in Machine Language. "View" oriented means that the pilot may determine his or her position by actually viewing the surrounding landmarks as opposed to using instruments which sense navigational references. This is a major departure from "instrument only" simulations which can be achieved through BASIC programs. Most instrument maneuvers and procedures may be practiced. The craft is a light-weight, single-engine airplane with low wings. A nose wheel which is both steerable and retractable is also modeled. Some aerobatics are possible including sustained inverted flight, aileron rolls, spins and stalls.



JOYSTICKS REQUIRED

32K MACHINE LANGUAGE

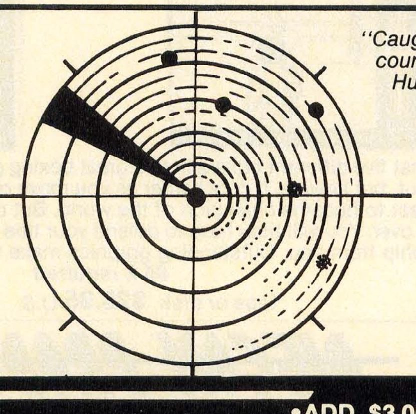
TAPE $29.95

DISK $34.95

NEW!

APPROACH CONTROL SIMULATION

From Betasoft Systems



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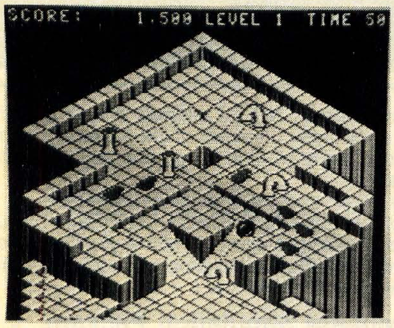
```
50 PRINT@390," COPYRIGHT (C) 198
5 ";
60 PRINT@422," PLEASE PRESS ENTE
R ";
70 X$=INKEY$:IFX$<>CHR$(13)THEN7
0
80 DATA-125,,,,,127,124,127,,127
,112,127,,124,124,127,,124,124,1
27,,127,112,112,,127,124,124,,,,
90 DATA,-113,,,,127,124,124,,127
,112,127,,115,124,112,,115,124,1
12,,127,112,112,,127,124,124,,,,
100 DATA,,-100,,,,124,112,112,,12
4,124,124,,124,124,124,,124,124,
124,,124,124,124,,124,124,124,,,
,
110 DATA,,,-125,,,,63,50,49,63,,
55,60,59,,63,49,62,,63,60,60,,63
,60,63,,,,,
120 DATA,,,,-113,,,63,52,56,63,,
63,60,63,,,63,61,50,,63,60,60,,63
,61,50,,,,,
130 DATA,,,,,,,60,48,48,60,,60,4
8,60,,60,48,60,,60,60,60,,60,48,
60,,,,,
140 CLS0:PRINT@232," PLEASE STAN
D BY ";
200 REM START PICTURE HERE
210 PMODE4:PCLS0:PMODE3:SCREEN0,
0:JL=RND(-TIMER)
220 CIRCLE(112,102),76,3,.75,.29
,.73:CIRCLE(144,102),76,3,.75,.7
8,.22
230 DRAW"BM128,52C3L8M-10,-4UL10
BM128,52R8M+10,-4UR10BM128,154L8
M-20,+3BM128,154R8M+20,+3"
240 DRAW"C3BM128,90G20R40H20BL20
L40E20F20BR40R40H20G20BM128,122L
6D6L12U6L12D6L12U6L20F12R4DR4DR4
DR8U4R12D4R12U4R12D4R12U4R12D4R8
UR4UR4UR4E12L20D6L12U6L12D6L12U6
L6"
250 PAINT(128,56),3,3:PAINT(128,
34),1,1
260 CIRCLE(128,102),76,1,.85,.35
,.17:CIRCLE(128,102),58,1,.95:CI
RCLE(128,102),30,1,1.9
270 DRAW"BM122,50C2NR4U10H10R4F1
0D10R4U10H10R4F10D10L4"
2000 REM START PUZZLE HERE
2010 DIM A(25),B(25),C(25),D(25)
,E(25),F(25),G(25),H(25),I(25),J
(25),K(25),L(25),M(25),N(25),O(2
5),P(25),Q(25),R(25),S(25),T(25)
,U(25),V(25),W(25),X(25)
2020 DIMGD(6,4),NN(24),MM(24),Z(
```

DIECOM PRODUCTS

MARBLE MAZE



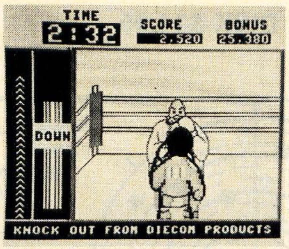
Move your marble around the mazes in your search for the finish line! Avoid the marble eaters, acid puddles and other creatures that inhabit the mazes. Avoid falling into holes or off the edges of the maze. Enter the **MARBLE MAZE contest:** the first five people to solve all the levels and identify the message and number win a free game from DIECOM PRODUCTS!

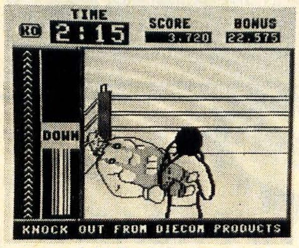
64 k and joystick required

tape or disk **$28.95** *U.S.*

$38.95 *Can.*

KNOCK OUT





Fight against five different boxers in this great boxing game! At first the boxers are easy to knock out, but beware, it gets harder as you move on. The boxers are out to stop you in your quest to become champion of the world. But once you become champion your task is not over. You will then have to defend your title against those trying to regain the championship from you. Outstanding graphics make this a must for your collection!

64 k required

tape or disk **$28.95** *U.S.* **$38.95** *Can.*

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Looking for new software
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```
24),Y(24),AA(25),BB(25)
2030 FORI=1TO4:FORY=1TO6:K=K+1:G
D(Y,I)=K:NEXTY,I
2040 FORB=32TO128STEP32:FORA=32T
O192STEP32:Q=Q+1:Z(Q)=A:Y(Q)=B:N
EXTA,B
2050 FORB=32TO128STEP32:FORA=32T
O192STEP32:T=T+1
2060 ON T GOSUB2080,2090,2100,21
10,2120,2130,2140,2150,2160,2170
,2180,2190,2200,2210,2220,2230,2
240,2250,2260,2270,2280,2290,230
0,2310
2070 NEXTA:NEXTB:GOTO2320
2080 GET(A,B)-(A+31,B+31),A,G:RE
TURN
2090 GET(A,B)-(A+31,B+31),B,G:RE
TURN
2100 GET(A,B)-(A+31,B+31),C,G:RE
TURN
2110 GET(A,B)-(A+31,B+31),D,G:RE
TURN
2120 GET(A,B)-(A+31,B+31),E,G:RE
TURN
2130 GET(A,B)-(A+31,B+31),F,G:RE
TURN
2140 GET(A,B)-(A+31,B+31),G,G:RE
TURN
2150 GET(A,B)-(A+31,B+31),H,G:RE
TURN
2160 GET(A,B)-(A+31,B+31),I,G:RE
TURN
2170 GET(A,B)-(A+31,B+31),J,G:RE
TURN
2180 GET(A,B)-(A+31,B+31),K,G:RE
TURN
2190 GET(A,B)-(A+31,B+31),L,G:RE
TURN
2200 GET(A,B)-(A+31,B+31),M,G:RE
TURN
2210 GET(A,B)-(A+31,B+31),N,G:RE
TURN
2220 GET(A,B)-(A+31,B+31),O,G:RE
TURN
2230 GET(A,B)-(A+31,B+31),P,G:RE
TURN
2240 GET(A,B)-(A+31,B+31),Q,G:RE
TURN
2250 GET(A,B)-(A+31,B+31),R,G:RE
TURN
2260 GET(A,B)-(A+31,B+31),S,G:RE
TURN
2270 GET(A,B)-(A+31,B+31),T,G:RE
TURN
2280 GET(A,B)-(A+31,B+31),U,G:RE
TURN
2290 GET(A,B)-(A+31,B+31),V,G:RE
TURN
2300 GET(A,B)-(A+31,B+31),W,G:RE
```

The RAINBOW
THE COLOR COMPUTER MONTHLY MAGAZINE

Back Issue Availability

Back copies of many issues of **THE RAINBOW** are still available.

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Prospect, KY 40059

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Note: Our Fourth Year Index, including an index to all editions of RAINBOW ON TAPE, is included in the July 1985 issue.

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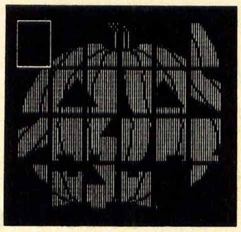
```
TURN
2310 GET(A,B)-(A+31,B+31),X,G:RE
TURN
2320 FORI=1TO24
2330 K=RND(24):IF NN(K)=1THEN233
0
2340 NN(K)=1:MM(I)=K:NEXTI
2350 PCLS2:LINE(21,21)-(234,170)
,PRESET,BF
2360 T=0:FORB=32TO128STEP32:FORA
=32TO192STEP32:T=T+1:L=MM(T)
2370 ON L GOSUB2400,2410,2420,24
30,2440,2450,2460,2470,2480,2490
,2500,2510,2520,2530,2540,2550,2
560,2570,2580,2590,2600,2610,262
0,2630
2380 LINE(A,B)-(A+31,B+31),PRESE
T,B:NEXTA,B
2390 TIMER=0:GOTO2640
2400 PUT(A,B)-(A+31,B+31),A,PSET
:RETURN
2410 PUT(A,B)-(A+31,B+31),B,PSET
:RETURN
2420 PUT(A,B)-(A+31,B+31),C,PSET
:RETURN
2430 PUT(A,B)-(A+31,B+31),D,PSET
:RETURN
2440 PUT(A,B)-(A+31,B+31),E,PSET
:RETURN
2450 PUT(A,B)-(A+31,B+31),F,PSET
:RETURN
2460 PUT(A,B)-(A+31,B+31),G,PSET
:RETURN
2470 PUT(A,B)-(A+31,B+31),H,PSET
:RETURN
2480 PUT(A,B)-(A+31,B+31),I,PSET
:RETURN
2490 PUT(A,B)-(A+31,B+31),J,PSET
:RETURN
2500 PUT(A,B)-(A+31,B+31),K,PSET
:RETURN
2510 PUT(A,B)-(A+31,B+31),L,PSET
:RETURN
2520 PUT(A,B)-(A+31,B+31),M,PSET
:RETURN
2530 PUT(A,B)-(A+31,B+31),N,PSET
:RETURN
2540 PUT(A,B)-(A+31,B+31),O,PSET
:RETURN
2550 PUT(A,B)-(A+31,B+31),P,PSET
:RETURN
2560 PUT(A,B)-(A+31,B+31),Q,PSET
:RETURN
2570 PUT(A,B)-(A+31,B+31),R,PSET
:RETURN
2580 PUT(A,B)-(A+31,B+31),S,PSET
:RETURN
2590 PUT(A,B)-(A+31,B+31),T,PSET
:RETURN
```

```
2600 PUT(A,B)-(A+31,B+31),U,PSET
:RETURN
2610 PUT(A,B)-(A+31,B+31),V,PSET
:RETURN
2620 PUT(A,B)-(A+31,B+31),W,PSET
:RETURN
2630 PUT(A,B)-(A+31,B+31),X,PSET
:RETURN
2640 PMODE4,1:SCREEN1,1:Z=1:QQ=0
:RR=0
2650 X$=INKEY$:LINE(Z(Z),Y(Z))-(
Z(Z)+31,Y(Z)+31),PSET,B:IFX$=CHR
$(8)THEN2680ELSEIFX$=CHR$(9)THEN
2690
2660 IFX$="S"THEN2880ELSEIFX$=CH
R$(13)THEN2710
```



```
2670 LINE(Z(Z),Y(Z))-(Z(Z)+31,Y(
Z)+31),PRESET,B:GOTO2650
2680 P=Z:Z=Z-1:IFZ=0THENZ=24:GOT
O2700:ELSE2700
2690 P=Z:Z=Z+1:IFZ=25THENZ=1
2700 LINE(Z(P),Y(P))-(Z(P)+31,Y(
P)+31),PRESET,B:GOTO2650
2710 GET(Z(Z),Y(Z))-(Z(Z)+31,Y(Z
)+31),AA,G:LINE(Z(Z),Y(Z))-(Z(Z)
+31,Y(Z)+31),PSET,BF
2720 QQ=Z
2730 X$=INKEY$:LINE(Z(Z),Y(Z))-(
Z(Z)+31,Y(Z)+31),PSET,B:IFX$=CHR
$(8)THEN2760ELSEIFX$=CHR$(9)THEN
2780
2740 IFX$="S"THEN2880ELSEIFX$=CH
R$(13)THEN2810
2750 LINE(Z(Z),Y(Z))-(Z(Z)+31,Y(
Z)+31),PRESET,B:GOTO2730
2760 P=Z:Z=Z-1:IFZ=QQ THENZ=Z-1
2770 IFZ=0THENZ=24:GOTO2800:ELSE
2800
2780 P=Z:Z=Z+1:IFZ=QQ THENZ=Z+1
2790 IFZ=25THENZ=1
2800 LINE(Z(P),Y(P))-(Z(P)+31,Y(
P)+31),PRESET,B:GOTO2730
2810 IFZ=QQ THEN2730ELSE GET(Z(Z
),Y(Z))-(Z(Z)+31,Y(Z)+31),BB,G:L
INE(Z(Z),Y(Z))-(Z(Z)+31,Y(Z)+31)
,PSET,BF
2820 RR=Z
2830 L=MM(RR)
2840 PUT(Z(RR),Y(RR))-(Z(RR)+31,
Y(RR)+31),AA,PSET:LINE(Z(RR),Y(R
R))-(Z(RR)+31,Y(RR)+31),PRESET,B
2850 L=MM(QQ)
2860 PUT(Z(QQ),Y(QQ))-(Z(QQ)+31,
Y(QQ)+31),BB,PSET:LINE(Z(QQ),Y(Q
Q))-(Z(QQ)+31,Y(QQ)+31),PRESET,B
2870 TY=0:GOTO2640
2880 CLS:SCREEN0,0:TD=TIMER:SC=I
NT(TD/356):MN=SC/10
2890 CLS:SCREEN0,0:PRINT@132,"YO
U TOOK "MN" MINUTES. "
2900 PRINT@196,"PRESS <P> FOR PI
CTURE."
2910 PRINT@260,"PRESS <R> TO RUN
."
2920 X$=INKEY$:IFX$="P"THEN2930E
LSEIFX$="R"THEN RUN30 ELSE2910
2930 PMODE4,1:PCLS1:SCREEN1,1:PM
ODE3:PCLS2:T=0:FORB=32TO128STEP3
2:FORA=32TO192STEP32:T=T+1
2940 ON T GOSUB2400,2410,2420,24
30,2440,2450,2460,2470,2480,2490
,2500,2510,2520,2530,2540,2550,2
560,2570,2580,2590,2600,2610,262
0,2630
2950 NEXTA,B
2960 X$=INKEY$:IFX$=CHR$(13)THEN
2890ELSE2960
```

NO-STAT II

Anti-Static

- TUFTED STATIC PROOF FABRIC LAMINATED TO CONDUCTIVE FOAM PAD
- ABSORBS DAMAGING STATIC ELECTRICITY
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STOP STATIC ZAP!
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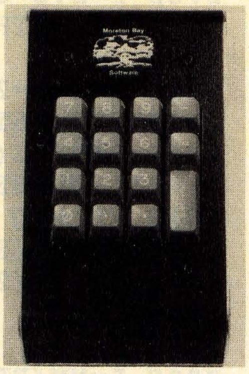

At last a quality numeric keypad for your Color Computer. This 15 key numeric pad plugs inside your computer and gives you the convenience of rapid numeric data entry. Dimensions: length 6½" (165mm), width 4" (101 mm), height 3" (76 mm). Baked black enamel finish. Specify computer model. MORE KEYS complete with cable and connector.

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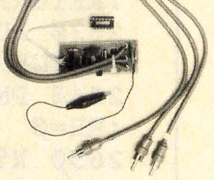
DOUBLE DRIVER

The BEST monitor driver available. Color composite, monochrome and audio output. For original CoCo D, E and F boards. $24.95.



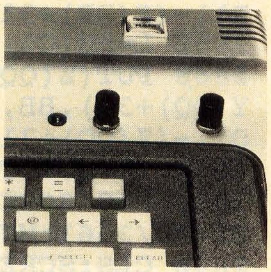
MONO II

Mono II for Color Computer 2. An excellent monochrome monitor driver that has audio output also. Specify model needed.

$24.95.

RESET-POWER-SWITCHES

A REAL IMPROVEMENT



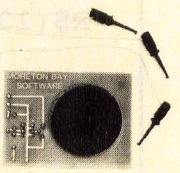
Move the power switch and reset switch where they belong. An LED power on light too! High quality parts, D and E boards and CoCo2 totally solderless kit. F board requires soldering.

Reset 1 Coco 1 $24.95
Reset 2 CoCo 2 $27.95

Either kit add $2.00 shipping and handling.

MINI MOUTH

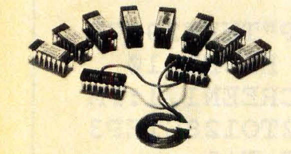
Add sound to your mute monitor. Hear the bells and whistles of your software again. No batteries. Solderless installation.



All Color Computer Models

$24.95

64K UPGRADES



Instantly access 64K via M/L totally solderless kit to upgrade E Boards. Kit includes eight 4164 prime chips and chips U29 and U11 already soldered. SPECIAL: E Board Kit $39.95, F Board and Color Computer 2 $26.95.

Guaranteed Pretested

THE COCO-SWITCHER

A QUALITY PIECE OF HARDWARE

CO CO SWITCHER

The CoCo Switcher allows you to hook up three peripherals to your RS-232 jack. Connect your modem, printer and any other RS-232 compatible peripheral to the CoCo Switcher. An LED on the CoCo Switcher shows if your computer is on or off at a glance, The LED flickers when transmitting or receiving data.

Dimensions: 2½" (64mm) x 4" (102 mm) x 5 7/8 (150 mm)

$39.95 plus $2.00 shipping and handling

FILE CABINET

Data base, alphabetizes, sorts numeric entries, searches for key words or numbers, computes totals & averages by categories, saves records, changes or deletes them. Up to 20 entries for each record, up to 256 characters for each entry. Mailing list included. Output to screen, printer or tape. Print all or selected records, +, −, ×, ÷ Numeric entries.

16K EXB Cassette $29.95

COCOWRITER II

Powerful and full featured. An excellent word processor at an affordable price. 32, 51, 64 or 85 characters per line, justify right, left, center, insert delete, move blocks. Menu driven printing and formatting. Tabs, etc. One of the best values in word processing today!

16 K EXB Cassette $34.95, EXB Disk $44.95

USE YOUR COLOR COMPUTER TO ORGANIZE YOUR BUSINESS

MORE BUSINESS

Version 3.2. The preferred business accounting package. A completely interactive system which features a general ledger you can customize for your own business. More than 900 accounts can be added. The accounts receivable routine will print invoices, record cash sales and automatically post to the general ledger. More than 400 customer balances can be maintained and automatically aged. Print customer statements and mailing labels. Profit and loss and balance statements printed at any time. Complete audit trails. Our most powerful business package. Buy the best!

32K Disk R/S DOS $99.95

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Maintain an inventory of over 1000 units. Total inventory value computed with a single key stroke. Print lists of stock on hand, stock on order and stock to be ordered. Can also be used by hobbyists and collectors. Now you can organize your collection in a professional manner.

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SOFTWARE

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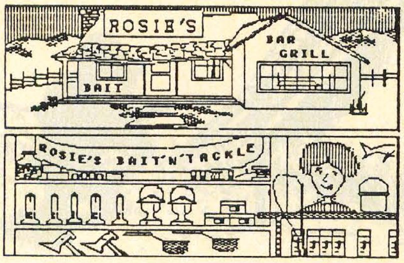

ECLIPSE

Allows you to "Zoom" in on the pixels of your graphics. Precision editing for your graphic creations. With ECLIPSE you can refine detailed graphics in high resolution pictures. Design game characters. Edit fonts. Easy to use. Bonus: extra graphic screens included
Requires 32K, disk $19.95

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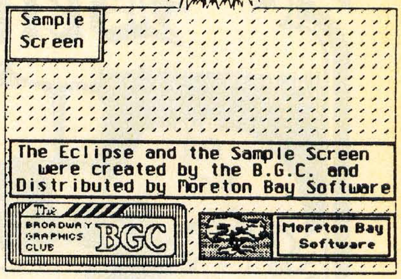


The Eclipse and the Sample Screen were created by the B.G.C. and Distributed by Moreton Bay Software

SAM DIAMOND, P.I.

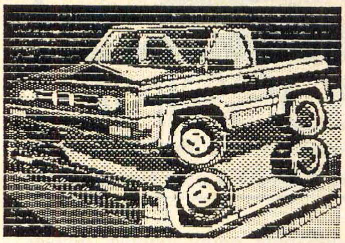
The first of our new Sam Diamond graphic adventures. More than 40 detailed high resolution graphic scenes. A killer is loose in the city. Can you bring him to justice before he gets you? Excellent graphics and a tough mystery to solve.

32K Disk Only $29.95
plus $2.00 shipping and handling

PLANETARIUM

PLANETARIUM

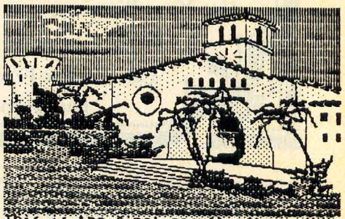
A five program celestial package. A star gazer's aid. A program to familiarize you with the appearance of the major constellations. 21 first magnitude stars. Moon phases. Day or night sky. Any latitude. 33 constellations. Charts planet locations from A.D. 0 to the year 10,000. Requires 16K Extended Basic. $19.95



GET THE MOST FROM YOUR GRAPHIC PROGRAMS

How to integrate Graphicom and CoCoMax. Two tutorial disks full of examples and suggestions. See how to create graphics step by step. Learn how to display and even animate your graphics from Basic.

1 Disk $14.95
2 Disks $24.95



This is the final result after editing the file using Graphicom.

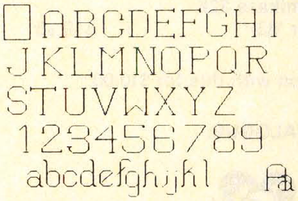
GRAPHICOM

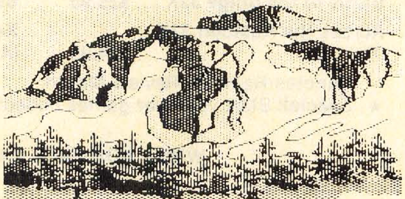
Buy Graphicom from us and get one of our unique picture disks free! Get our improved Picture Disk One also. The first in the new generation of graphic utilities. An excellent utility. Requires: 64K EXB, Disk Drive and Joy Sticks. Three disks and the best bound documentation for only $29.95.

Calligraphy STAMP DISK: Useful letters and designs for making your own signs and menu screens.

Adventure Disk 1: Indoor scenes and objects. Helps you draw pictures and learn more about Graphicom.

Adventure Disk II: Outdoor scenes and objects. A graphicom tutorial as well as a useful library of images you can use.

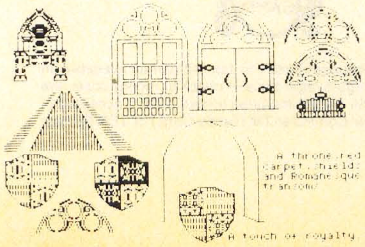




The three stamps below are very useful for shading Each one will make two different colors depending on horizontal position. When possible, shade first then draw the outline

Calligraphy Disk II: 23 New letter stamp sets.

Adventure Disk II


A throne, red carpet, shields and Romanesque transoms
A touch of royalty

Adventure Disk 1

1 Picture Disk $15.95
2 Picture Disks $24.95
3 Picture Disks $29.95
4 Picture Disks $34.95

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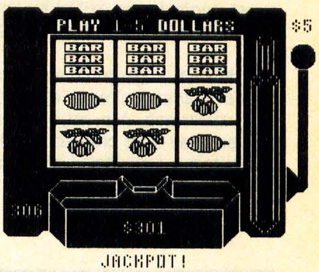
Own the hottest slots on the block! Run your own casino with 6 different slot machines. Control the payout Bet $1.00 to $5.00. Choose double and triple jackpots. Gamble to your heart's content. Play casino odds, moderate odds or get rich quick. Play a game of skill - SLAMSHOT! - try to stop the reels yourself.

32K EXB, Joystick optional
$24.95 Specify Disk or Tape



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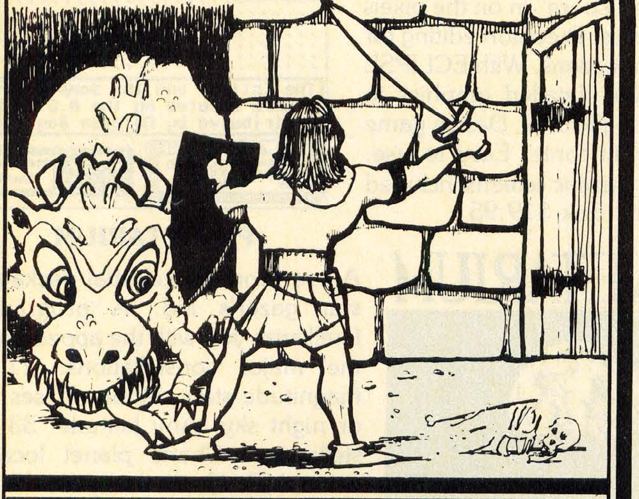
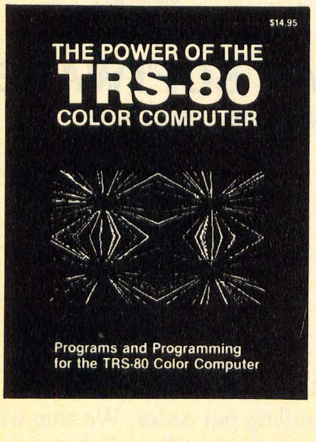


MEDIEVAL ADVENTURE

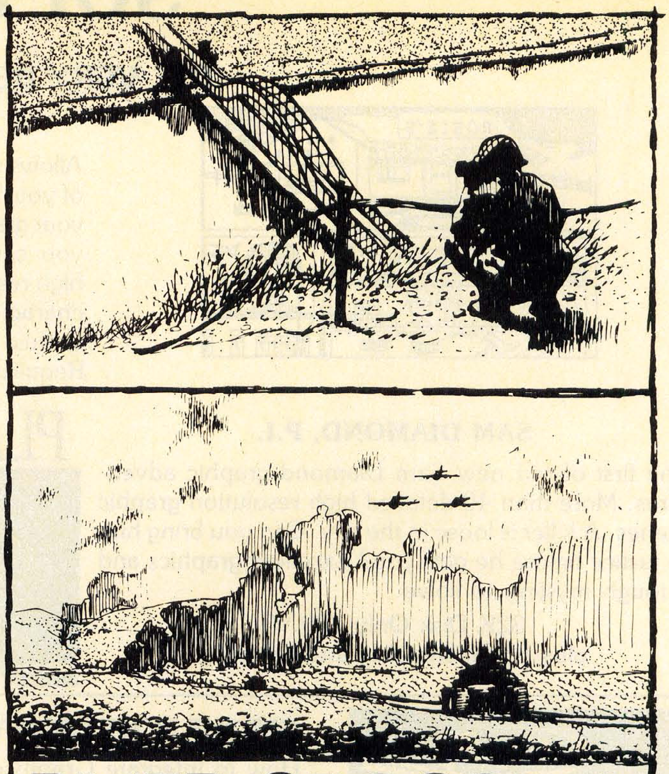
Use Your Weapons and Your Wits! Fight Off The Evil That Lurks In The Dark And See If You Can Escape From The Multi-Leveled Dungeon Of DENNA!

After capturing the Castle of Denna, you and your trusted followers are given to wine and song and celebration. So much celebration that you deplete the overthrown king's ale and must rummage the castle for more. You soon discover a small strongbox covered with strange, indecipherable writings. You bring it back to your comrades where you discover inside a rusted metal staff on which similar writings are recorded. Convinced it is a powerful magic wand, you become the focus of jokes and chiding. One of your friends playfully touches the staff to your shoulder while scoffing at your belief in magic. Their boisterous laughter is quickly replaced with open-mouthed astonishment as you vanish in a blinding flash of light. You find yourself in a dark, damp and stinking dungeon deep within the bowels of the castle. Armed with nothing more than your good sense and survival skills, you must avoid being killed by the many monsters and pitfalls inhabiting these depths. You must ESCAPE FROM DENNA.

DENNA is a graphic adventure game requiring 32K and Extended Basic. Player picks his character along with strength, agility, physique and alertness. He must maneuver through a multi-tiered dungeon whose play and characteristics are different every game. Player collects items, inventory, checks status and any of 7 other options. Combat with all sorts of monsters. Lots of fun. *Cassette $25.95 and disk $28.95. Versions are different.*



THE POWER OF THE TRS-80 COLOR COMPUTER by John Sharp and David Bolton is a great guide to programming featuring short, powerful programs including Bar Chart Plotter, Secret Code Maker, Racing Driver, City Bomber, Space Invader, Checksum, Bio-rhythms, Lissajous Figures, True Interest Rate, Database, Screen Crawler and much more. Plus sections on debugging, checksums and program merge. Routines are fully documented in clear, concise terms. *This book is loaded with features for experts and beginners alike. $14.95.*



RIVER CROSSING

A Company Commander Game Module From ARK ROYAL GAMES For The TANDY Color Computer

RIVER CROSSING A Company Commander game module. (Player must have C/C to play.) Involves a host of new functions including Situation Map, new terrain features, minefields, spotters, late arrivals, flamethrowers and renovated operation of direct fire, weapon malfunction, artillery, enemy armor operations, terrain modifiers and a more precise victory objective as player takes on Russian, Japanese or German opponent in any of 12 scenarios including Borisov, New Guinea, Guadalcanal, Pont l'Abbe, Kursk (where you command an armored squad of Panther tanks), Peleliu, Remagan, Sicily and others. *$19.00 tape or disk.*

OTHER ARK ROYAL GAMES...
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A Final Session With The 'A' Option

By Joseph Kolar
Rainbow Contributing Editor

Creating graphics on CoCo is so rewarding and the possibilities so endless. To prove the point, we are going to have one final session using the 'A' option of `DRAW`. Considering that we have limited ourselves to utilizing a single design element, we *have* come a long way, baby! As a beginner, you realize the door being opened for you has countless avenues to explore. The only limitation is the depth of your imagination.

You are urged to ask yourself questions while proceeding through this tutorial. Make a note of them and later pursue these byways; you never know where they will lead. Rest assured you will have learned something.

Turn on your best friend, CoCo, and from Listing 1 key in lines 0 through 40 and 500. A$ and C$ design units are the same ones you used previously. Perhaps we are in a rut, however, these units are ideal to demonstrate the scope of the 'A' option.

Our project for today is to create a display using the eight possible orientations, radiating from a single, central point (LHUERFDG). They will be displayed one at a time and then erased. We will put them in an endless loop and attempt to give the display a feeling of motion.

Line 40 creates the horizontal design, A$, radiating to the left from a central point. Note that you could have started in some other quadrant (orientation) of A$. (You may want to explore this on your own.)

After you key in a line, `RUN` and study it; `BREAK` unless otherwise directed. You will get the maximum benefit by progressing slowly through this tutorial.

Key in Line 50. CoCo did not require any new or additional information, so it added C$ to the display. Key in Line 60. The only new information CoCo needed to know was the new orientation, "A1." Key in Line 70. It is similar to Line 50, serving the same purpose.

`LIST` and look over what you have worked up. Without referring to Listing 1, create and key in the four design units needed to display all eight orientations. They will be designated as lines 80, 90, 100 and 110.

Note that the diagonal units begin at the central starting location. We prefer to back off three units from the central point to give the entire display a twist to the right. In Line 20, insert after the opening quotation mark ("), BL3. In Line 30, insert BH3. Now the design elements appear to rotate like a whirligig.

Frankly, backing off three units from the central point is a time-consuming project and must be given as information changes to CoCo in lines 40-110. You may want to work it out on your own. If you want to puzzle it out (and it is worth doing), after deleting BL3 from Line 20 and BH3 from Line 30, make a `CSAVE"PUZZLE"` and set it aside to work on later.

Our next step is to remove each item, one at a time, in the same order that we displayed them. Key in Line 120. We used C0 to inform CoCo of our wish to blank out A0 of A$. In the two-color `PMODE4`, use either C0, C2 or C4 to blank out the design. Try them all and see! You may prefer to use only the C0 .

You must have figured what Line 130 should read to erase the first diagonal — key it in! Then key in the rest of the lines, 140 through 190. You will notice the display was completed and then erased. To recycle it to continue indefinitely, key in Line 200. The only trouble is that nothing happens! Why?

Notice that in Line 40 no 'C' color option is given. CoCo knew it was C1 because, without instructions, it knew that it is the color you desired. It is the default option. CoCo is given a

---

(Joseph Kolar is a free-lance writer and programmer dedicated to proselytizing for computers in general, and the CoCo specifically.)

color change in Line 120, C0. When it recycled back to Line 40, the last information regarding color that CoCo had was C0. It assumed there was no change and you see the net result. Nothing!

The solution is to edit Line 40, insert C1, or if you prefer, C3, right after the opening quotation mark ("). Now CoCo knows for sure that every time it reaches Line 40, C1 is demanded.

> ***"The point is that a beginner should always try* different *values. Take time out to do so. Every try allows you to compare new results with previous ones; it is a good way to learn."***

When in doubt, it is best to put all the required option information that CoCo may require, such as 'S' for size and 'C' for color, and since we are working with 'A', 'A' for angle orientation. Even if it is redundant, it won't detract from or affect the resultant display. As we progress, you will omit the extraneous instructions to CoCo.

We have a rapidly revolving whirligig. Suppose we wanted to slow it down. We could try putting pauses between each element displayed. First, let us try slowing down the part that draws the elements. Add Line 45: 45 FOR Z=1 TO 200: NEXT then RUN and press BREAK. You should put on a few more to get a better view. Key in lines 55, 65 and 75 to read the same as Line 45.

That is not too bad! Since we are going to require many pause lines, we might as well create a GOSUB routine. Key in 600 FOR Z = 1 TO 200: NEXT: RETURN. Re-key Line 45 to read 45 GOSUB 600. If it is OK, re-key lines 55, 65 and 75. Key in required lines 85, 95, 105 and 115 (all GOSUB 600).

It looks neat! You might like to change the value in Line 600 (200) to see if a longer or shorter pause appears to be more effective. Using a value of 300 provides more time to study the display as the elements are augmented. A value of 100 or less (to about 30) gives a better sense of speed. It is up to you to choose a value. For the purposes of the tutorial, 200 will be used.

The point is that a beginner should always try *different* values. Take time out to do so. Every try allows you to compare new results with previous ones; it is a good way to learn. The newcomer gets to know what to expect when he does this or that. Ask yourself "If I do this, it looks like this. If I do that, it looks like that. What is the difference? What did I change? How did it affect the display? Is this important information I want to squirrel away?" That is what the keys are for! Tickle them! CoCo won't get mad.

All these GOSUB lines could have been tacked on to the DRAW lines, separated by colons (:), to make multiple line statements. When you are in a mad frenzy of creativity, make separate lines. Why? It is easier to follow the listing and you may decide to add additional items to the DRAW lines.

It is easier to edit short program lines. Also, errors are easier to spot. There is plenty of time when the program is finalized to make it more elegant by tightening it up: removing unnecessary or redundant program lines and/or making multiple-line statements.

There is no sense in putting GOSUB routines between the erased units in lines 120-190. The only effect would be additional pauses that would cumulatively become one long, additional pause. Who wants to look at a blank screen?

Suppose we added four A$ units, size S4, to give the display more body? Add +"S4"+A$ to lines 40, 60, 80 and 100. Uh oh! Before we go any further, let's change the size to S12 and RUN. It is too large! Let's try S10.

Note: Usually only S4, S8, S12 and S16 will work properly when diagonal lines H, E, F and G are used to create a design. The figures will become distorted. Coincidentally, the designs we created, A$ and C$, have proportional lines in even number of units, 2, 4, 6 and 8, and the geometrical relationship did not suffer.

Let's take time out to illustrate this point. Copy from Listing 1 lines 15, 700 and 710 but omit the REM markers. After running, try in succession S13 to S16. You will get varied degrees of distortion. The more diagonals, the more distortion. The rule is play it safe. Use sizes beginning with S4 and increment upwards to larger sizes by +4.

Make lines 15, 700 and 710 REM lines by inserting an apostrophy (') at the beginning of each line. Back to the drawing board!

Add to Line 40 +"S10"+A$+"S8". The S10 increases the size and A$ prints this larger design element over the smaller one. S8 maintains the size of the diagonal element, C$, in the following line without disturbing it.

Make the same additions to lines 60, 80 and 100. In order to make the blanking lines, 120, 140, 160 and 180, erase these additional design units and add +"S10"+A$+"S8" to them.

The design is off-center due to the insinuation of the larger size. Adjust this by changing the BM128,96 part of the instructions to CoCo in Line 40 to BM138,106. The design is swept off the screen very nicely, but the placing of the units is jerky; adjust Line 600. Use a value of about 30 or 40 to get a rapid, yet smooth rotation.

Just to see what happens, remove the BL3 from Line 20 and BH3 from Line 30. It's OK but it must be recentered by changing the BM values in Line 40 to the original BM128,96.

Could we add four S4-sized units to the A$ elements? Change the S8 at the end of the Line 40 to +"S4" and add +A$+"S8". This adds a small unit to the first horizontal orientation. Make the same changes in the other three orientations at lines 60, 80 and 100. That looks good enough. The S4 units add interest to the display as it is created. Not erasing it enhances the grand design.

Just in case it looks better blanked out, modify lines 120, 140, 160 and 180 by changing S8 to S4 and adding +A$+"S8". Check it out! If you like this result, CSAVE it. If you prefer the other, readjust lines 120, 140, 160 and 180 and CSAVE. Remember to adjust the pause in Line 600 to some value that pleases you.

Out of curiosity, in lines 120, 140, 160 and 180 change S10 to S8 and delete the rest of the line. This is just another variation that erases only the S8 on both the A$ and C$ elements. CSAVE if you desire.

You could jazz up the diagonals by adding to Line 50 +"S4"+C$+"S8", etc. Or try this: Change the last A$ in lines 40, 60, 80 and 100 to C$. There is no end to what you can investigate.

You are encouraged to dream up things to add, remove or change. Take time out to try them all. Make this tutorial a springboard to further experimentation. If you play around, your endeavors may suggest unexpected avenues to explore.

Mentally, question everything you key in. Never be afraid to alter a program. You should always strive to modify a program, giving it your personal imprimatur. Create your own designs on graph paper and even substitute them for the designs in lines 20 and 30. You will be fascinated at the startling designs you create. Are you still sure you're a beginner?

Let me leave you with a challenge. Display and remove each design element in turn. It won't prove anything in particular, but who knows? ☐

85 184
END 47

Listing 1: RADIALS

```
0 'LISTING1
5 CLEAR500
10 PMODE4,1:PCLS:SCREEN1,1
15  GOTO700
20 A$="H2L2G6L8H6L2G2F2R2E6R8F6R
2E2"'HORIZONTAL ORIENTATION
30 C$="U2H2L6H8U6H2L2D2F2R6F8D6F
2R2"'DIAGONAL ORIENTATION
40 DRAW"C1A0S8BM128,96"+A$+"S10"
+A$+"S4"+A$+"S8"
45 GOSUB600
50 DRAW+C$
55 GOSUB600
60 DRAW"A1"+A$+"S10"+A$+"S4"+A$+
"S8"
65 GOSUB600
70 DRAWC$
75 GOSUB600
80 DRAW"A2"+A$+"S10"+A$+"S4"+A$+
"S8"
85 GOSUB600
90 DRAWC$
95 GOSUB600
100 DRAW"A3"+A$+"S10"+A$+"S4"+A$
+"S8"
105 GOSUB600
110 DRAWC$
115 GOSUB600
120 DRAW"A0C0"+A$+"S10"+A$+"S8"
130 DRAWC$
140 DRAW"A1"+A$+"S10"+A$+"S8"
150 DRAWC$
160 DRAW"A2"+A$+"S10"+A$+"S8"
170 DRAWC$
180 DRAW"A3"+A$+"S10"+A$+"S8"
190 DRAWC$
200 GOTO40
500 GOTO500
600 FOR Z=1TO 200:NEXT:RETURN
700 'DRAW"S12BM90,90U6R3FDGL2NLF
3BR4 HU4ER2FD4GNL2BR4 BUFR2EUHL2
HUER2FBR3BU NR4D2NR3D4R4"
710 'GOTO710
```

225 201
END 238

Listing 2: DANCE

```
0 'DANCE
10 '(C) 1984, J.KOLAR
30 PMODE3:PCLS:PMODE4
40 A=164:B=102
50 DIM S(2),T(2),U(2),K(2),L(2)
60 DRAW"BM2,0R4F2D4G2L4H2U4E2BFR
2F2D2G2L2H2U2E2"
66 DRAW"BM50,4R8"
67 DRAW"BM20,0F8"
68 DRAW"BM70,8E8"
69 DRAW"BM80,0BR4D8"
70 GET(0,0)-(8,8),T,G
75 GET(20,0)-(28,8),S,G
76 GET(50,0)-(58,8),U,G
77 GET(70,0)-(78,8),K,G
78 GET(80,0)-(88,8),L,G
80 PCLS:SCREEN1,1
110 FOR Z=2000TO 1946 STEP-9
111 FOR R=30 TO -80 STEP-5:C=Z
200 X=INT(A-R*SIN(C-.83)):Y=INT(
B-R*COS(C-.83))
212 SOUND50,1
225 PUT(X-40,Y-10)-(X-32,Y-2),U,
OR:FORM=1TO30:NEXT
230 PUT(X-40,Y-10)-(X-32,Y-2),K,
PSET:FORM=1TO30:NEXT
235 PUT(X-40,Y-10)-(X-32,Y-2),S,
OR:FORM=1TO30:NEXT
240 PUT(X-40,Y-10)-(X-32,Y-2),L,
PSET:FORM=1TO30:NEXT
245 PUT(X-40,Y-10)-(X-32,Y-2),T,
OR
250 NEXTR,Z
251 FOR R=90TO 90 STEP-20:FOR Z=
412 TO 48 STEP-4:C=Z
252 X=INT(A-R*SIN(C)):Y=INT(B-R*
COS(C)):SOUND50,1
253 PUT(X-40,Y-10)-(X-32,Y-2),T,
PSET
254 PUT(X-40,Y-10)-(X-32,Y-2),T,
NOT:NEXTZ,R
257 PLAY"V25O3L8CO2FEFEO1BO2CC V
15O3L8CO2FCFL16CFCCO1BL8O2CEEC V
25O3L8CO2GECO1BO2CFC V25O3L8O3CO
2BBGL4EDL8EDL4ECO1BO2L2C"
300 FORX=1TO2000:NEXT:PCLS:GOTO8
0
```

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64K
Disk

This new and improved version has been modified for 64K

An Encore Presentation

For The Analog-To-Digital And Back Again

By Stephen Gunn

After seeing Jeremy Spiller's "Analog-to-Digital And Back Again" article (June 1985, Page 36), I just had to try it! I typed it in and it worked; the only problem was that it would only give about 13 seconds of sound. The program only used 32K, so I modified it for 64K.

The assembly language listing is rather short, so it has been modified. Also included are four routines for moving blocks of memory from the upper page of RAM into the lower page and back again, therefore the BASIC SAVEM and LOADM commands can be used.

How the New Program Works

The BASIC program no longer pokes the routine into memory, but loads it from disk (or cassette). This makes changing the assembly language routine easier. The BASIC program then sets a flag in RAM, so even if you press BREAK and then RUN the program again, it won't bother reloading the machine language routine. The BASIC program also turns off the interrupts which allows for better sound quality.

(Stephen Gunn has had his computer for three years. He plans to enter college this fall and major in computer science.)

You are presented with a menu similar to the old version's. Selection one is the same as in the original program. Selection two is different in that you can now also control the speed at which the tape is read in. Selecting a speed of one will give a higher sampling rate, hence better sound but less playing time (about 15 seconds). Selecting 15 as the speed will give much lower sound quality, but the playback time is 75 seconds, five times longer than the original program.

(One note: If you want something to sound the same when it plays back, select the same speed of playback as when it is read in. For example, if you read something in at the speed of 11, to have it sound the same it must play back at the speed of 11.)

Selection three is playback, same as in the original version. Selection four lets you save what is in memory to disk, but be warned that a disk will hold only two complete dumps from memory. The filename has to be seven characters or less because the program saves memory out in three files, adding the numbers '1', '2' and '3' to the filename given. After you save memory out, what is in memory is more or less destroyed by the saving process, so to listen to the same file use Selection five to reload it. (Selection five loads files back into memory.)

The modifications were created for a disk system, but I see no reason why they shouldn't work for cassette if you change all of the LOADMs to CLOADMs and all of the SAVEMs to CSAVEMs.

Loading Instructions

First, using an editor/assembler, type in and assemble the ML program. If you have a disk system and are using the cartridge *EDTASM*, assemble it to tape, then reconnect the disk controller and transfer it to disk. If you are using disk *EDTASM*, just assemble it to disk. Make sure you use the filename *SOUND*.

If you have the old BASIC version of Jeremy's program, you can just add my routines and changes to his program, otherwise you will have to type in the whole program (it isn't too long).

I enjoyed modifying *A/D DRVR* for 64K, and I hope you will enjoy using it! If you should have any questions regarding this new version, you may contact me at 944 Wisconsin, Oak Park, IL 60304. Please include an SASE. ☐

```
170 .......17
340 ......151
END .....102
```

Listing 1: 64KDRVR

```
0 'WHEN YOU SAVE A FILE,
   WHATEVER IS IN MEMORY IS
   RUINED BY THE SAVING PROCESS,
   SO THAT IF YOU WANT TO LISTEN
   TO THE FILE YOU JUST SAVED,
   YOU WILL HAVE TO RELOAD IT.
10 CLS:GOTO460
20 CLEAR100,&H1AFF:POKE65283,52:
IFPEEK(512)=0THENLOADM"SOUND":PO
KE512,85
30 POKE65344,0
40 CLS
50 PRINT"  ANALOG TO DIGITAL CON
VERTER"
60 PRINT"        BY JEREMY SPILLER
"
70 PRINT"         MODIFIED FOR 64K
"
80 PRINT"         BY STEPHEN GUNN"
90 PRINT
100 PRINT"1. TEST VOLUME OF TAPE
 RECORDER"
110 PRINT"2. READ TAPE (DIGITALI
ZE)"
120 PRINT"3. SAY DATA (PLAYBACK)
"
130 PRINT"4. SAVE DATA"
140 PRINT"5. LOAD DATA"
150 PRINT
160 INPUT" PICK A NUMBER";A
170 ON A GOTO 190,240,290,330,39
0
180 GOTO 40
190 CLS
200 PRINT"TO GET BACK TO MENU PR
ESS RESET THEN RUN THIS PROGRAM.
"
210 PRINT
220 PRINT"SET YOUR TAPE RECORDER
 TO THE   CORRECT VOLUME"
230 MOTORON:EXEC &H1B49
240 CLS:INPUT"TYPE A NUMBER 1-15
 TO CONTROL   THE SPEED.  ENTER=
DEFAULT OF 6. =>";S:IFS=0 THEN S
=6
250 IF S>15THEN240
260 POKE&H1B0B+3,S
270 PRINT"READING TAPE":MOTORON:
EXEC &H1B00:MOTOROFF
280 GOTO40
290 CLS:INPUT"TYPE A NUMBER 1-15
 TO CONTROL   THE SPEED.  ENTER=
DEFAULT OF 6. =>";S:IF S=0 THEN
S=6
300 IF S>15 THEN290
310 CLS:PRINT"SAYING":POKE&H1B35
+3,S:EXEC &H1B25
320 GOTO40
330 CLS:LINEINPUT"ENTER FILE NAM
E: ";A$:IFLEN(A$)>7THEN330
340 PRINT"SAVING"
350 SAVEM A$+"1",&H1C00,&H7FFF,0
360 EXEC &H1B69:SAVEM A$+"2",&H1
C00,&H7FFF,0
370 EXEC &H1B80:SAVEM A$+"3",&H1
C00,&H3700,0
380 GOTO30
390 CLS:LINEINPUT"FILE TO LOAD:
";A$
400 PRINT"LOADING"
410 LOADM A$+"3":EXEC&H1B97
420 LOADM A$+"2":EXEC&H1BAF
430 LOADM A$+"1"
440 GOTO30
450 '*PCLEAR 0*
460 POKE&H3C0,&H5F:POKE&H3C1,&H5
C
470 POKE&H3C2,&H96:POKE&H3C3,&HB
C
480 POKE&H3C4,&H1F:POKE&H3C5,&H0
2
490 POKE&H3C6,&H7E:POKE&H3C7,&H9
6:POKE&H3C8,&HA3
500 EXEC &H3C0
510 GOTO20
```

Listing 2: SOUND

```
                    00100 ****************************
                    00110 *  SIMPLE A/D CONVERTER *
                    00120 *   BY JEREMY SPILLER    *
                    00130 *         1985           *
                    00140 ****************************
  1B00              00150         ORG     $1B00
```

```
1B00 7F   FFDF    00160 START   CLR     $FFDF
1B03 8E   1C00    00170         LDX     #$1C00
1B06 7F   FF20    00180         CLR     $FF20
1B09 C6   08      00190 STO10   LDB     #$8
1B0B 108E 0006    00200 TIME    LDY     #6
1B0F 31   3F      00210 TIME2   LEAY    -1,Y
1B11 26   FC      00220         BNE     TIME2
1B13 74   FF20    00230         LSR     $FF20
1B16 49           00240         ROLA
1B17 5A           00250         DECB
1B18 26   F1      00260         BNE     TIME
1B1A A7   80      00270         STA     ,X+
1B1C 8C   FF00    00280         CMPX    #$FF00
1B1F 25   E8      00290         BLO     STO10
1B21 7F   FFDE    00300         CLR     $FFDE
1B24 39           00310         RTS
                  00320 ***************************
                  00330 *  RECONSTRUCTS SOUNDS   *
                  00340 ***************************
1B25 7F   FFDF    00350 PLAY    CLR     $FFDF
1B28 8D   26      00360         BSR     SOUND
1B2A 8E   1C00    00370         LDX     #$1C00
1B2D A6   80      00380 SOUND1  LDA     ,X+
1B2F C6   08      00390         LDB     #8
1B31 48           00400 SOUND2  LSLA
1B32 76   FF20    00410         ROR     $FF20
1B35 108E 0006    00420 TIMER   LDY     #6
1B39 31   3F      00430 TIMER2  LEAY    -1,Y
1B3B 26   FC      00440         BNE     TIMER2
1B3D 5A           00450         DECB
1B3E 26   F1      00460         BNE     SOUND2
1B40 8C   FF00    00470         CMPX    #$FF00
1B43 25   E8      00480         BLO     SOUND1
1B45 7F   FFDE    00490         CLR     $FFDE
1B48 39           00500         RTS
                  00510 ***************************
                  00520 *  VOLUME CHECK ROUTINE *
                  00530 ***************************
```

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1B49 8D    05      00540 CHECK   BSR    SOUND
1B4B 76    FF20    00550 VOLUME  ROR    $FF20
1B4E 20    FB      00560         BRA    VOLUME
1B50 B6    FF01    00570 SOUND   LDA    $FF01
1B53 84    F7      00580         ANDA   #$F7
1B55 B7    FF01    00590         STA    $FF01
1B58 B6    FF03    00600         LDA    $FF03
1B5B 84    F7      00610         ANDA   #$F7
1B5D B7    FF03    00620         STA    $FF03
1B60 B6    FF23    00630         LDA    $FF23
1B63 8A    08      00640         ORA    #8
1B65 B7    FF23    00650         STA    $FF23
1B68 39            00660         RTS
                   00670 ***************************
                   00680 * LOAD/SAVE ADDED BY      *
                   00690 * STEPHEN GUNN FOR 64K    *
                   00700 ***************************
1B69 7F    FFDF    00710 SAVE1   CLR    $FFDF
1B6C 8E    8000    00720         LDX    #$8000
1B6F 108E  1C00    00730         LDY    #$1C00
1B73 A6    80      00740 LOOP1   LDA    ,X+
1B75 A7    A0      00750         STA    ,Y+
1B77 8C    E3FF    00760         CMPX   #$E3FF
1B7A 23    F7      00770         BLS    LOOP1
1B7C 7F    FFDE    00780         CLR    $FFDE
1B7F 39            00790         RTS
1B80 7F    FFDF    00800 SAVE2   CLR    $FFDF
1B83 8E    E400    00810         LDX    #$E400
1B86 108E  1C00    00820         LDY    #$1C00
1B8A A6    80      00830 LOOP2   LDA    ,X+
1B8C A7    A0      00840         STA    ,Y+
1B8E 8C    FEFF    00850         CMPX   #$FEFF
1B91 23    F7      00860         BLS    LOOP2
1B93 7F    FFDE    00870         CLR    $FFDE
1B96 39            00880         RTS
1B97 7F    FFDF    00890 LOAD1   CLR    $FFDF
                   00900 **CORRESPONDS TO SAVE 2**
1B9A 8E    1C00    00910         LDX    #$1C00
1B9D 108E  E400    00920         LDY    #$E400
1BA1 A6    80      00930 LOOP3   LDA    ,X+
1BA3 A7    A0      00940         STA    ,Y+
1BA5 108C  FEFF    00950         CMPY   #$FEFF
1BA9 23    F6      00960         BLS    LOOP3
1BAB 7F    FFDE    00970         CLR    $FFDE
1BAE 39            00980         RTS
1BAF 7F    FFDF    00990 LOAD2   CLR    $FFDF
                   01000 **CORRESPONDS TO SAVE 1**
                   01010 **($8000 - $E3FF)**
1BB2 8E    1C00    01020         LDX    #$1C00
1BB5 108E  8000    01030         LDY    #$8000
1BB9 A6    80      01040 LOOP4   LDA    ,X+
1BBB A7    A0      01050         STA    ,Y+
1BBD 108C  E3FF    01060         CMPY   #$E3FF
1BC1 23    F6      01070         BLS    LOOP4
1BC3 7F    FFDE    01080         CLR    $FFDE
1BC6 39            01090 END     RTS
           0000    01100         END
00000 TOTAL ERRORS
```

The RAINBOWfest Reporter

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Writers: Richard A. White and A. Buddy Hogan **Editor: Wayne Fowler**

Prospect, KY **May 1985** **Vol. 1, No. 2**

Innovation, memory expansion mark RAINBOWfest-Chicago

CHICAGO, Ill. — More memory and more innovation sum up the major observations made at RAINBOWfest-Chicago. As we have come to expect, a large turnout of CoCo owners jammed around booths to be astounded by EARS, Colorburst, *Thunder RAM* and other innovations, or to take advantage of bargain prices on disk drives.

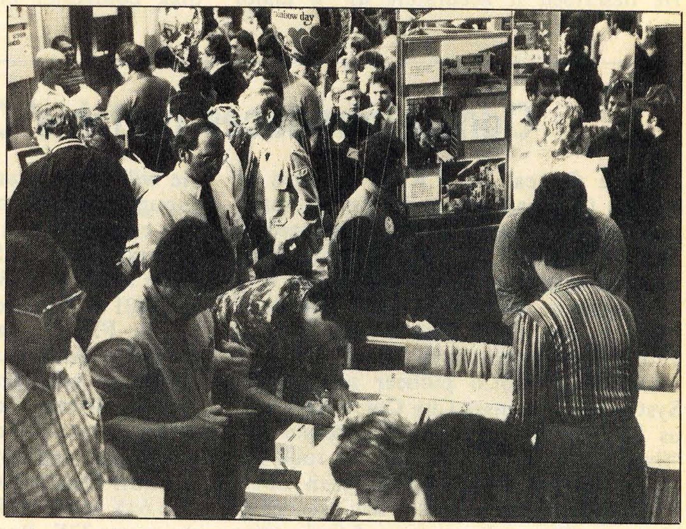
When not crowding into the exhibit room at the Woodfield Hyatt, attendees filled the seminar rooms to hear about topics ranging from speech recognition and spreadsheets to BASIC09 and OS-9.

Interest in OS-9 continued, with Dale Puckett autographing copies of his book *The Complete Rainbow Guide To OS-9* at THE RAINBOW booth. Unfortunately, sales were so brisk that the supply of books for sale ran out by noon Saturday.

Bare 5¼-inch disk drives sold for prices approaching $100. One booth was offering a show-only special on a pair of Digital Equipment 5¼-inch drives in a case with power supply and cable for only $249. It takes a show like RAINBOWfest to bring out the bargains.

Chicago treated us to perfect spring days — dry, sunny and comfortably cool. Many bought lunch from a sandwich bar set up by the hotel and ate sitting out on the lawn.

The next RAINBOWfest will be in Princeton, N.J., Oct. 11-13, 1985.



Over 11,000 people attended RAINBOWfest-Chicago.

New speech recognition system brings a glimpse of future

Speech
Systems

Rich Parry of Speech Systems exhibited EARS, a speech recognition system.

Far and away the most popular exhibit was the Speech Systems booth, which was displaying EARS, Electronic Audio Recognition System. This speech-recognition system consists of a microphone attached to a headset that is, in turn, attached to a hardware module, which plugs into the expansion port of the CoCo.

Designer Rich Parry explained in his seminar on speech recognition that only one year ago he had said it couldn't be done, but the introduction of a "miracle" speech chip has changed all that. EARS is actually a sound recognition system that is remarkably accurate (Parry says 95-98 percent). The accompanying software adds several new commands to BASIC for system use.

The uses of such a system include the automatic control of external devices (particularly appreciated by the handicapped) and "communication" with a CoCo equipped with *Super Voice* or one of the other speech synthesizers. The limits are one's imagination.

At $99.95, EARS brings capabilities to the CoCo that could not be purchased for $10,000 a year ago. Industry and business applications of speech recognition are few and far between. This package allows the CoCo owner to experiment with and be in the forefront of another technology of the future.

Memory at 20 bytes per penny

Bob Rosen of Spectrum Projects introduced his 256K memory upgrade board, appropriately named *Thunder RAM*. They sold out so fast at $119.95, we didn't even get a chance to see them.

Rosen says the upgrade, which is installed inside the CoCo, emulates a 40-track RAM disk that is 30 times faster than an ordinary floppy drive. It allows you to have a 60K print spooler, create BASIC programs up to 128K long or store up to 30 or more Hi-Res graphics screens in memory at one time. He described it accurately as "a major breakthrough for the CoCo." This may just be the beginning, however, because Bob promised to keep his programming wizards hard at work over the summer.

Across the room, Dave Skrock of MAX-SYS Electronics and Software Company showed off the Colorburst System, offering up to one megabyte of RAM. Colorburst is a very attractive and sturdy external hardware device that plugs directly into the CoCo expansion port and contains six software selectable expansion ports and a disk controller connector in the back. Options ranging from 64K to one megabyte cost from $570 to $999.

Colorburst memory is in addition to what you already have. The ROM in the unit has routines that will quickly access the extra memory, acting as a print spooler or a RAM disk. It operates with all versions of the CoCo and is OS-9 and Disk BASIC compatible. The unit even includes a parallel Centronics interface.

Both *Thunder RAM* and Colorburst are evolving products whose usefulness will increase as more software becomes available.

Odneal introduces 'portable' CoCo

Steve Odneal of P.R.O. Systems of Kansas City had passers-by doing double takes as they stared at what appeared to be a "portable" CoCo at his booth. Next to it sat a normal CoCo hooked up to a 10 megabyte, half-height hard disk drive ready to run under Disk BASIC, OS-9 or FLEX at the user's whim.

Odneal, a CoCo pioneer and former SysOp of the Kansas City CoCo BBS, told us he took a Commodore portable and "fixed it." And fix it he did. He took out all the insides, replaced them with CoCo 2 components and added a few touches of his own. The unit sports a 5-inch color monitor, two 5¼-inch floppy drives (it also will come with the 10-megabyte hard disk and one floppy drive), detachable keyboard with a 24-inch cord, front panel monitor control, and 64K Disk Extended BASIC.

The PCC (P.R.O.'s name for it) is compatible with all CoCo software since all standard functions and addresses were retained. Odneal's machine is a prototype. He will begin production only if there is enough interest from the CoCo Community. The estimated cost of the standard unit is approximately $1,500. If interested, give Steve a call at (913) 631-0665 or write him at 10601 W. 63 Street, Shawnee, KS 66203.

The P.R.O. hard disk drive comes complete with case, power supply and necessary software for $995. With the supplied drivers, the drive acts just like other drives under OS-9 or FLEX, except it's five times faster and holds lots of files.

Under Disk BASIC, the CoCo must be put into 64K mode with the ROMs copied into the upper 32K. Boot software patches Disk Extended BASIC and adds some system code. This creates no problem with BASIC programs, but there are conflicts where machine language programs are written to use the same memory space. Work is going forward on this problem, and Marty Goodman, of *Graphicom* fame, worked to "fix" *Telewriter* while RAINBOWfest was in progress.

Chip McGinnis (right) of P.R.O. Systems demonstrated his company's new PCC.

Sports statistics from Sugar Software

Susan Davis (center) announced at RAINBOWfest that she had moved Sugar Software to Hollywood, Fla.

Susan Davis introduced the *Sports Statistics Package* for baseball, football, basketball or soccer. These are designed for the coach, team manager or fan who needs accurate team and opponent records.

Ms. Davis also reported that Sugar Software has moved to Hollywood, Fla., and that she's planning a special sale of sleds, snow shovels, ice skates, sweaters, coats and boots that are not in keeping with a poolside lifestyle. These are guaranteed to work with any type computer.

Two young Sunday visitors talk about the day's events.

Rainbow publisher says Color Computer remains strong despite industry problems

RAINBOW Publisher Lonnie Falk set the record straight at the "CoCo Community Breakfast," as he remembered some events in CoCo and RAINBOW history. The CoCo Community was out in force to hear him at the sold-out event. His conclusion? "Not bad for a little game machine."

Falk is a gadget lover, as anyone who has visited Prospect knows. RAINBOW's offices are full of Falk's gadgets. The new Color Computer looked like a mighty neat gadget in late 1980 and Lonnie fell for a 4K model, the only one then available.

Falsoft President Lonnie Falk addresses the CoCo Community Breakfast.

Unlike some of Falk's other gadgets, the CoCo worked. It worked so well that hundreds of thousands of lives have been touched through the RAINBOW, which came to life as a four-page newsletter first written at Falk's dining room table. And that same machine proudly continues to perform chores to this day, though surrounded by many supposedly mightier computers.

Falk noted the ills now afflicting the microcomputer industry and pointed out that the CoCo world has been less affected than most other makes. The CoCo Community, which is made up of loyal and satisfied owners, plays a major role in the continued vitality of the machine. They stay with the machine and strongly recommend it to others. They are active users and continue to support a market providing a variety of software and hardware products. RAINBOWfest itself is a manifestation of the CoCo Community in action.

The future looks bright to Falk. Radio Shack continues to support the machine. A new and greater CoCo will come, he predicted, although he couldn't say exactly when. New, exciting, high-tech products continue to come to the CoCo market — and the CoCo Community thrives.

"Not bad for a little game machine."

His glasses gave him away

Dennis Kitsz (sans beard) and Green Mountain Micro exhibited an extender cable for Disk Expansion Interface that was very popular.

Green Mountain Micro's Dennis Kitsz had shaved off his beard and gotten a shorter haircut. Fortunately, he kept his distinctive glasses or no one would have recognized him. The only person whose appearance changed more at this RAINBOWfest was Bob Rosen, who was not only sans beard, but also 60 pounds lighter.

Kitsz quickly sold out of a hardware product everyone said didn't exist — an extender cable for the Disk Expansion Interface. The heavily shielded cable comes in four lengths ranging from 6 inches to 36 inches and is priced from $20 to $40. Another new item is a 16-channel, 12-bit analog-to-digital converter board that plugs into the ROM port or expansion interface.

Be an air traffic controller

Fast on the heels of his fine *P51 Mustang Attack Flight Simulator*, Tom Mix introduced *Air Traffic Controller* by Betasoft Systems. Frequent air travelers who have experienced extended waits in holding patterns and a variety of approaches to a particular airport will appreciate the situations modeled by this Simulation. The air traveler probably does not fully appreciate the magnitude of an air traffic controller's problems. Both experience and a system are needed to stay on top of the variety of situations offered by this excellent program.

Print a graphics letterhead from *Telewriter-64*

Dennis Derringer and Paul Kush demonstrated *Telegraphics*, an impressive new Derringer Software offering. This utility allows you to use your favorite graphics editing program (*Master Design, CoCo Max, Graphicom*, etc.) to design a letterhead and then print it out while using *Telewriter-64*.

Hearing about the P.R.O. hard disk, Derringer ambled by with a copy of his *Pro-Color-File*. It worked fine and reported that there was room for 32,000- plus 100-character records. *Pro-Color-File* is not set up to handle much more than 4,000 records. Derringer plans to do some program upgrading.

Criticism of OS-9 leads Hogg to introduce QT

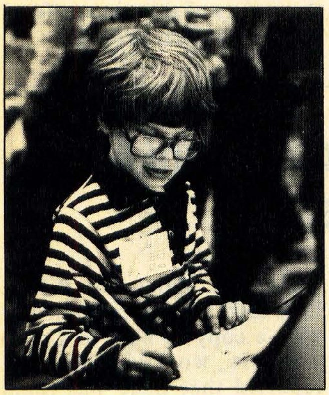
While we've been dreaming about the "CoCo 09," Frank Hogg has been working. He used RAINBOWfest to introduce his QT (Quad Terminal), a 68008 multi-user (up to four) computer with 128K (upgradable to 512K), four serial ports and two parallel ports. It supports two double-sided, double-density 96 tpi floppy disk drives and has an interface for a Winchester hard disk drive. The 68008 is a 32-bit CPU that runs at a scorching eight MHz!

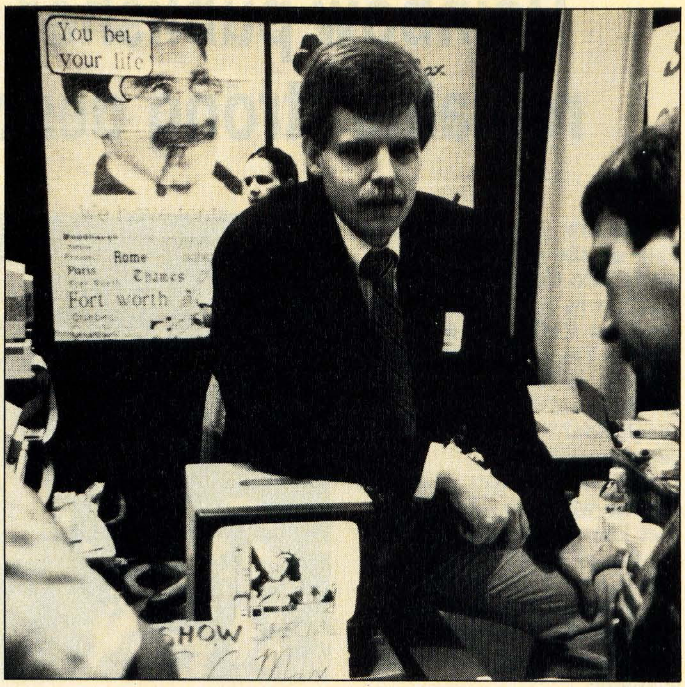
A ton of software is bundled with the QT. You get OS-9/68K, BASIC09, *DynaCalc, Stylograph, Mailmerge, Spelling Checker*, a relocating macro assembler with linkage editor, screen and line editors, and an interactive debugger. Separately, the software costs about $400 more than Frank Hogg Laboratory's basic QT price of $1,595.

An impressive physical feature of the QT is that its sturdy metal case requires no more room than an average box of facial tissue (5½ by 11¾ inches). Of course, the terminal required by the system will add to the space requirements (not to mention the out-of-pocket requirements). One could use the CoCo as a terminal for the QT, but that seems like such a waste.

Frank Hogg has the reputation of being an outspoken member of the CoCo Community and he tells us that his criticism of OS-9 for the CoCo led him to development of the QT. If criticism has such impressive byproducts, then maybe we need more criticism.

Frank Hogg, left, and Tony DiStefano discussed products at RAINBOWfest, including Hogg's QT, a 68008 multi-user computer with 128K.


Remember when you were in school and longed for an electric pencil!



Tim Jenison of Colorware says his company is almost caught up with orders for *CoCo Max*.

CoCo Max ships from stock

CoCo Max was the star of the Irvine RAINBOWfest and was in short supply for two months thereafter; Colorware's booth was just as popular at Chicago.

Tim Jenison and John Monin of Colorware reported they have finally caught up with orders and are shipping disk *CoCo Max* from stock. A tape version is also being shipped. Coming shortly is a font disk with 14 new typefaces.

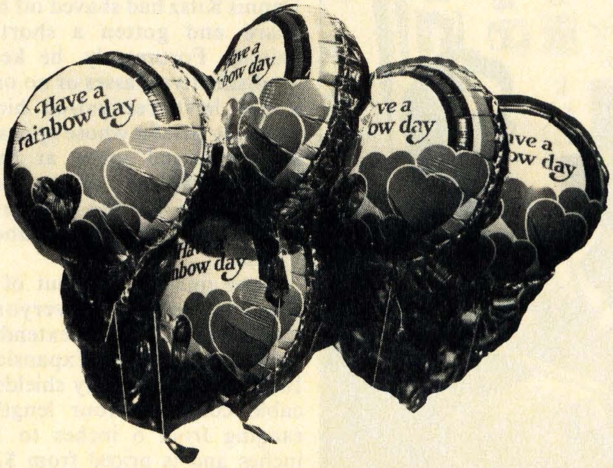
Next RAINBOWfest is scheduled Oct. 11-13 in Princeton, N.J.

The next RAINBOWfest will be Oct. 11-13 in Princeton, N.J., and among the guest speakers will be well-known computer expert Bill Barden. Barden will be the keynoter at the CoCo Community Breakfast and will also hold a seminar on computer languages.

Among other speakers featured during the upcoming RAINBOWfest are: Steve Blyn, "The CoCo and Special Education"; Dan Downard, "Inside Your Color Computer"; Dale Puckett, "Beginners Tour of OS-9" and "Beginners Tour of BASIC09"; Dennis Kitsz, "Your Own Color Computer Hardware"; and Paul Hoffman, "A CoCo Gallery."

Also, Puckett will be available during the show to autograph copies of his new book, *The Complete Rainbow Guide to OS-9*.

The Hyatt Regency Princeton will serve as host. ☐



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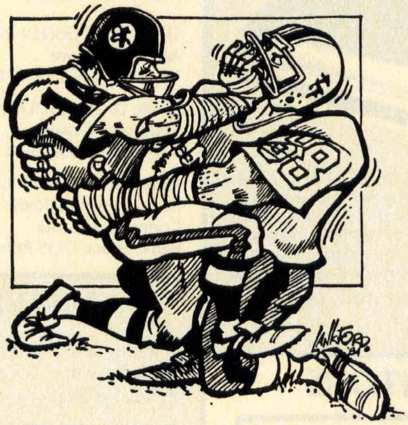

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- 1985 schedule data file included free.
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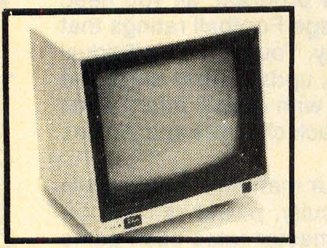

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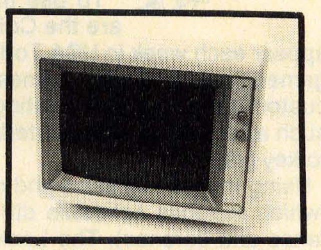

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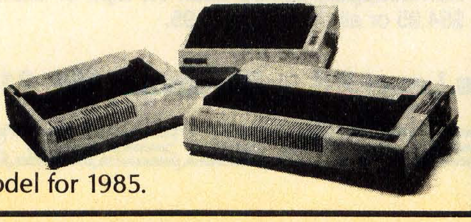

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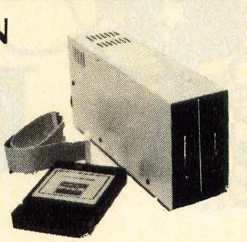

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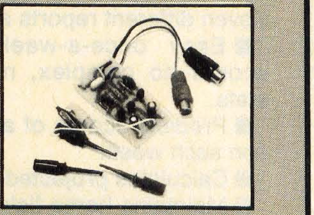
UNIVERSAL VIDEO DRIVER

- Works with Monochrome Monitors
- Works with Color Monitors
- Easy Installation—No Soldering



ENABLES YOUR COCO TO OPERATE WITH A VIDEO MONITOR INSTEAD OF A TELEVISION.

Carefully engineered to work with **ALL** Color Computer models, including the new **COCOII**.

- Great Price! **ONLY $29.95**

$ Save Money on Your Cassette & Disc Supplies $

We buy cassettes and discs in large quantities for our own use and can pass the savings on to you.

C-10 Cassettes w/labels	.59 ea	10 for $5.50
Cassette storage box	.25 ea	10 for 2.00

Basic 1.2 ROM	$39.95
Extended 1.1 ROM w/Manual	49.95
Disc 1.1 ROM or J/DOS ROM w/Manual	39.95

5¼ Discs

High quality, nationally advertised brand. *Guaranteed Performance.* We will replace any disc that fails during normal use. Discs are double density, reinforced hub with sleeve. $12.95 for 10 discs in an attractive storage box. • **Great Price!**

NEW!

DISC STORAGE

Attractive, heavy duty, smoked acrylic case. Holds and protects up to 75 5¼" discs with six moveable, indexed dividers.

SUPER BARGAIN — ONLY $9.95

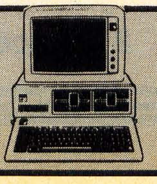
SPECIAL—Purchase this storage case including 10 discs for only $21.95

"The Connecting Link"

Only $29.95

CoCo-Util is a valuable utility program that allows you to transfer Tandy Color Computer disc files to your MS-DOS machine. You may also transfer MS-DOS files to a Color Computer disc. CoCo-Util will save you countless hours of retyping . . . a great new utility.

PC-XT II



We now offer IBM PC-XT compatible computer systems. Don't settle for a Tandy 1000 or other standard PC until you check our systems and prices.

Starting at $865.

SERIOUS STUFF

ACCOUNTING SYSTEM

The Mark Data Products Accounting System is ideal for the small businessman needing a fast, efficient means to process income and expenses, prepare detailed reports and maintain most of the information required at tax time. The system is a family of programs which operate by means of a "menu" selection scheme. When the operator selects a task to perform, the computer loads a program designed to handle that task from the system disc. The system disc contains all of the programs required to create, update and maintain data files and prepare the necessary accounting reports including a transaction journal, a P & L or income report, an interim or trial balance and a balance sheet.

This accounting software equals or exceeds higher priced packages for other computers and includes a detailed operating manual. **ONLY $99.95**

ORDER ENTRY SYSTEM

The Mark Data Product sales order processing system provides a fast, efficient means to enter orders, print shipping papers and invoices, prepare sales reports, and monitor receivables. The system automatically enhances the monitor screen to a 51 character by 24 line display. 32K of memory is required along with an 80-column printer and one or more disc drives.

This order entry software equals or exceeds higher priced packages for other computers and includes a detailed operating manual. **ONLY $99.95**

EASY EDIT

Easy-Edit is a versatile, easy to use text editor which is particularly convenient for assembly language and BASIC programming. This editor offers powerful text handling capabilities along with many special features including a built-in disc operating system, 32/64K memory sense, a 51 character by 24 line screen, auto key repeat, extensive error reporting, and complete compatibility with popular assemblers. Requires 32K and at least one disc drive. Master disc and instructions are packaged in an attractive 3-ring binder. **$34.95**

EASY-FILE Data Management System

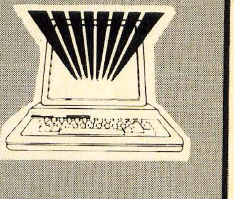
Rainbow, Nov. '84 *"Easy File is one program that lives up to its name. . . Easy File is so easy it speaks for itself."*

Hot CoCo, Feb. '85 *"I've examined four database programs for the CoCo in the last few months. Easy File is the easiest to master and the one that best addresses my needs. If you need to organize the information in your life, Easy File might just be the best method."*

Need a good mailing list or customer list program? How about a program to keep track of your investments, your computer magazines, or record collection? Do you have an inventory of all household items for insurance purposes? **EASY-FILE** will do all of these things and many more. The **EASY-FILE** master disc and instructions are packaged in an attractive 3-ring binder. Requires 32K and at least one disc drive.

Order Yours Now! Get Organized for Only $59.95!

SUPER SCREEN



The Color Computer Supercharger

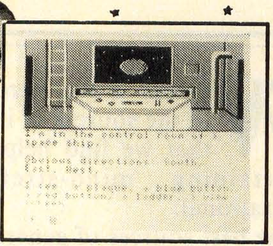
- A big 52 character by 24 line screen
- 'PRINT @' is fully implemented on the big screen
- Easily combine text with hi-res graphics
- Auto-key repeat for greater keyboard convenience
- The 'ON ERROR GOTO' statement is fully implemented
- Control codes for additional function

Guaranteed to be the most frequently used program in your software library. . . once you use it you won't be without it! **Cassette $29.95 Disc $32.95**

JUST FOR FUN

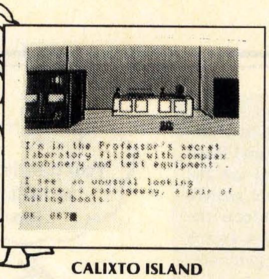
Adventures Now Available for IBM & Tandy 1000/1200

Adventure and Arcade Games • Cassette $24.95 Disc $27.95 • All require 32K



TREKBOER

This exciting hi-res **adventure** begins aboard the starship Trekboer in the 21st century. Life on Earth is threatened by a deadly virus and your mission is to search the frontiers of space and return with a cure to save mankind from disaster



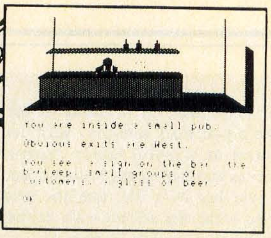
```
I'm in the Professor's secret
laboratory filled with complex
machinery and test equipment.

I see: an unusual looking
device, a passageway, a pair of
hiking boots.

OK, 687
```

CALIXTO ISLAND

A valuable museum treasure has been stolen; can you recover it??? This is a challenging **adventure** with an occasional twist of humor. You'll visit a secret laboratory, a Mayan pyramid, and you'll meet crazy Trader Jack—all in living color and exciting detail.



```
You are inside a small pub.

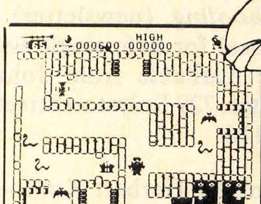
Obvious exits are West.

You see: a sign on the bar, the
barkeep, small groups of
customers, a glass of beer.

OK
```

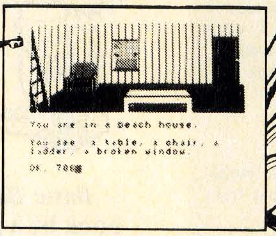
SHENANIGANS

Countless legends tell of a magnificent pot of gold hidden at the end of the rainbow. Many have attempted to find the marvelous treasure but success has eluded them and it remains hidden to this day. You, as a dedicated **adventurer**, have determined to search for the fabled riches.



TUT'S TOMB

Explore the ancient, mystical tomb of the great Pharoah. Find the magical keys which lead you to unbelievable treasures as you outmaneuver the creatures that slither and swarm about you. Super fast **arcade** action—this one will knock your socks off.



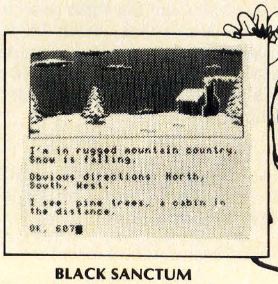
```
You are in a beach house.

You see: a table, a chair, a
ladder, a broken window.

OK, 708
```

SEA SEARCH

Get your shark repellant and scuba tanks ready! The graphics in this **adventure** are truly outstanding and the underwater scenes are unforgettable. You'll run into a pirate, a mermaid and some hungry sharks in this coloful and unique treasure hunt.



```
I'm in rugged mountain country.
Snow is falling.

Obvious directions: North,
South, West.

I see: pine trees, a cabin in
the distance.

OK, 687
```

BLACK SANCTUM

Encounter the forces of black magic as you roam around an 18th century monastery. You'll see all the evil locations in this spooky **adventure**; you'll love searching for and destroying evil in this classic tale. A MUST for every adventure game fan!

SHIPPING: All orders under $100 please add $2 regular, $5 air. All orders over $100 please add 3% regular, 8% air. California residents please add 6% sales tax. Orders outside the continental U.S., check with us for shipping amount; please remit U.S. funds. Software authors—contact us for exciting program marketing details. We accept MasterCard and VISA. Distributed in Canada by Kelly Software.

FREE—Send for our free catalog flier.

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SCHOOL IS IN THE HEART OF A CHILD

4K

The DragonTown Library

By Bob Albrecht and Ramon Zamora
Rainbow Contributing Editors

"School Is In The Heart Of A Child" is for parents of quite young children. We want to help you work and play with your 3- to 8-year-old child and learn to use computers as a joyful family experience. We suggest ways to use the home computer as another means to encourage your child's independence, growth and control over her own life. See the pride on her face as she directs the computer to do what she selects with deliberation. See her head gears switch to "on" as she progresses step by step with your presence and caring guidance. We will explore (we hope, with your help) the following:

- Specific "teaching" techniques so the discovery can be the child's own.
- Critical evaluation of software based on extensive playtesting in family and related environments.
- Additional resources to consult: books, magazines, software publishers, networks, etc.
- Suggestions for interludes and fun times away from the computer (a must!): call the librarian for information; watch TV together and discuss it; work together as volunteers in a community project; take an "awareness" walk.
- Whatever we learn from families we work with in Menlo Park or from you, our readers. Let's pool our knowledge and share our experiences as we learn from our children.

Copyright© 1985 by DragonQuest, P.O. Box 7627, Menlo Park, CA 94026-7627. Portions of "School Is In The Heart Of A Child" are extracted from *TRS-80 Color BASIC* by Bob Albrecht.

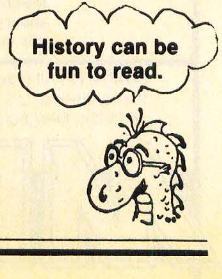
(Well-known author Bob Albrecht has written numerous articles and books on personal computers through his association with DragonQuest. Ramon Zamora is author and co-author of several books, co-founder of Computer Town USA!, and is currently designing computer games for kids at Child Ware Corp. in Menlo Park, Calif.)

You can learn how to help a kid learn.

We read a lot; here are some of the sources of information that we find helpful, useful, entertaining, mind-stretching or inspirational.

The best sources of general information on teaching your own children are books and a newsletter by John Holt. We recommend these: *How Children Fail* (Rev., 1982) $5.95, *How Children Learn* (Rev., 1983) $7.95, *Teach Your Own* (1981) $8.95 and *Growing without Schooling* (newsletter) one year (6 issues) for $15; single issue, $2.50. All are available from John Holt Associates, 729 Bolyston Street, Boston, MA 02116.

Basic Skills is a book by Herbert Kohl — a wonderful book by a philosopher and doer who spends his life learning about children from children. We wish every person who is concerned about the growth and well-being of children would read this book. If your bookstore doesn't have it, order it from Bantam Books, Inc., 414 East Golf Road, Des Plaines, IL 60616. Cost is $3.95 plus $1.25 postage and handling.


History can be fun to read.

Amazing! Most people can now afford a home computer more powerful than the outrageously expensive institutional computers of yesteryear. To find out why and how it happened, read these two books: *Fire in the Valley* by

YOU should be here . . .

FULL 80 COLUMN CAPABILITY

```
*>>>ELITE SOFTWARE & PBJ WORD-PAK<<<

At last... you can give YOUR Color Computer a full 80 character screen
display, AND have powerful software that's easy to use.  Elite Software and
the PBJ Word-Pak... truly a winning combination.

It's easy... all you need for an 80 column display is Word-Pak II, a "Y" Cable
(for disk users), and a monitor.  Everything plugs together.  NO hardware
modifications are needed.

Imagine using the power of a program like Elite*Word with an 80 column
display.  Elite*Word/PBJ practically displays your final document.  Just look
at this screen...  you see Right-Side text justification, Page Numbering,
Bottom Page Margin, Page Break, Top Margin, and Auto-Line Centering.
Elite*Word/PBJ can display even more!  Elite*Spel/PBJ will find your spelling

                                   *- 1 -

________________________________________________________________________________

errors.  And just look at Elite*Calc/PBJ with an 80 column screen display...
```

```
Elite*Spel          SAMPLE/BIN:1

                    2 Suspects

                    1. List suspects on screen
                    2. List suspects on printer
                    3. Review suspects
                    4. Apply corrections to file
                    5. Edit file in context
                    6. Learn marked words
                    7. List words used on screen
                    8. List words used on printer
                      <BREAK> Return to 1st menu

                      Select:
```

```
            A1    H20   27382
BLANK
>
  : A :: B :        C          :: D :: E :: F :: G :: H :
 1:
 2:                 **** L O O K   A T   T H I S ****
 3:           >>>> F U L L   8 0   C O L U M N   D I S P L A Y <<<<
 4:
 5:=============================================================================
 6:       MONTHLY CHECK REGISTER                       BALANCE FORWARD:  $1243.56
 7:-----------------------------------------------------------------------------
 8:
 9: CHK #   WRITTEN TO:                          DATE      AMOUNT  DEPOSIT  BALANCE
10:  1020   ELITE, INC.                         4/12/84    $79.95           $1163.61
11:  1021   ELECTRIC LIGHT CO.                  4/13/84   $102.50           $1061.11
12:  1022   JOHN DOUGH                                     $50.00           $1011.11
13:                                             4/15/84             $500.00 $1511.11
14:  1023   INFERNAL REVENUE SERVICE                     $1200.00            $311.11
15:  1024   RAINBOW MAGAZINE                    4/20/84    $14.00            $297.11
16:  1025   ELITE, INC.                                    $24.95            $272.16
17:  1026   RADIO SHACK                         4/25/84   $123.95            $148.21
18:  1027   ELITE, INC.                                    $29.95            $118.26
19:  1028                                                                    $118.26
20:  1029                                                                    $118.26
```

Elite·File NEW!

Elite·Calc/3.0 **Elite·Word**™

SAME POWERFUL FEATURES + 80 COLUMN DISPLAY
Specify Disk or Tape, $79.95 each + $3.00 Shipping/Handling
These versions not available at Radio Shack

Elite·Spel™ NEW!

SAME POWERFUL FEATURES + 80 COLUMN DISPLAY
Specify Disk or Tape, $39.95 each or $20.00 when purchased with Elite·Word + $3.00 Shipping/Handling.

WORD - PAK II
Our Price $125.00
$3.00 Shipping/Handling
"Y" Cable Connector $25.00

SPECIAL - BUY
Elite·Calc or Elite·Word
with WORD - PAK
and **deduct 10%**
from total price.

Elite Software 201 Penn Center Blvd., Suite 301, • Pittsburgh, PA 15235 • (412)795-8492

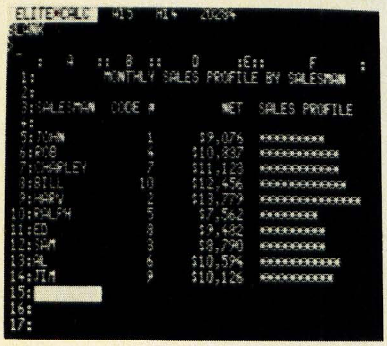
★ COLOR COMPUTER WORKSHEET ★

NEW!

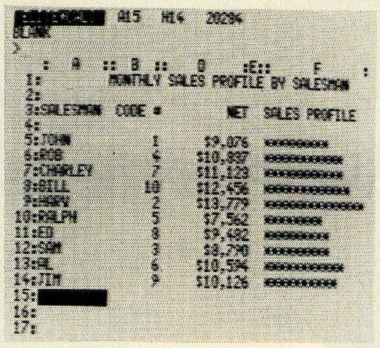
Elite•Calc™/3.0

How do you improve a widely acclaimed worksheet program that's already powerful, fast, and easy to use? We've added new features, more commands, four screen displays, while maintaining excellent ease of use and full compatability with all existing Elite•Calc worksheets. You have more power and flexibility than ever before! Elite•Calc/3.0 is your best choice, and it's waiting to work for you.

- ☑ **WINDOW - TITLE LOCK** Holds Column and/or Row Titles
- ☑ **FOUR SCREEN DISPLAYS** Features 2 Hi-Res Screens
- ☑ **IMPROVED STORAGE** Stores 30% More Information
- ☑ **ZAP COMMAND** - wipes out numbers...leaves text & formulas

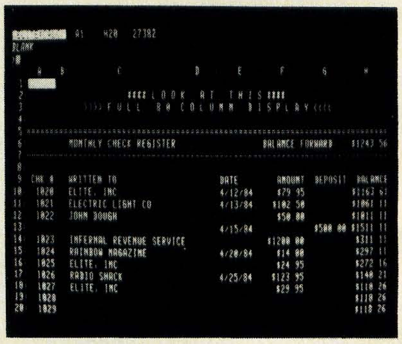


```
ELITE•CALC  A15  H14  2028%
BLANK
>
  :  A  :: B  ::   D    :E::    F     :
 1:          MONTHLY SALES PROFILE BY SALESMAN
 2:
 3:SALESMAN  CODE #          NET  SALES PROFILE
 4:
 5:JOHN           1       $9,076  **********
 6:ROB            4      $10,897  ************
 7:CHARLEY        7      $11,123  ************
 8:BILL          10      $12,456  *************
 9:HARV           2      $13,779  ****************
10:RALPH          5       $7,562  *********
11:ED             8       $9,482  **********
12:SAM            3       $8,790  **********
13:AL             6      $10,594  ************
14:JIM            9      $10,126  ***********
15:
16:
17:
```



```
ELITE•CALC  A15  H14  2029%
BLANK
>
  :  A  :: B  ::   D    :E::    F     :
 1:          MONTHLY SALES PROFILE BY SALESMAN
 2:
 3:SALESMAN  CODE #          NET  SALES PROFILE
 4:
 5:JOHN           1       $9,076  **********
 6:ROB            4      $10,897  ************
 7:CHARLEY        7      $11,123  ************
 8:BILL          10      $12,456  *************
 9:HARV           2      $13,779  ****************
10:RALPH          5       $7,562  *********
11:ED             8       $9,482  **********
12:SAM            3       $8,790  **********
13:AL             6      $10,594  ************
14:JIM            9      $10,126  ***********
15:
16:
17:
```

Elite•Calc/3.0 offers TWO 51 character displays



```
             A1    H20   27382
BLANK
>0
    A  B        C              D      E       F        G       H
 1
 2              ####L O O K   A T   T H I S####
 3           >>>>F U L L   8 0   C O L U M N   D I S P L A Y<<<<
 4
 5 ******************************************************************
 6          MONTHLY CHECK REGISTER              BALANCE FORWARD   $1243 56
 7 ------------------------------------------------------------------
 8
 9  CHK #   WRITTEN TO                  DATE      AMOUNT  DEPOSIT  BALANCE
10   1020   ELITE, INC                  4/12/84   $79 95           $1163 61
11   1021   ELECTRIC LIGHT CO           4/13/84  $102 50           $1061 11
12   1022   JOHN DOUGH                            $50 00           $1011 11
13                                      4/15/84           $500 00  $1511 11
14   1023   INFERNAL REVENUE SERVICE            $1200 00           $311 11
15   1024   RAINBOW MAGAZINE            4/20/84   $14 00           $297 11
16   1025   ELITE, INC                            $24 95           $272 16
17   1026   RADIO SHACK                 4/25/84  $123 95           $148 21
18   1027   ELITE, INC                            $29 95           $118 26
19   1028                                                          $118 26
20   1029                                                          $118 26
```

Special Elite•Calc/PBJ version for Word-PAK

Existing Elite•Calc user — contact us for upgrade pricing

CALC-LIST is a separate, machine language, utility that works independently of Elite•Calc. It can read either tape or disk worksheet files, and will give you additional information that was previously "hidden" within your worksheet. With CALC-LIST, you can list on the screen (or print) the actual contents of your worksheet cells, including FORMULAS. **CALC-LIST......................$24.95**

SPECIFY TAPE OR DISK ELITE CALC/3.0 $69.95

Elite-Calc/3.0 Tape Radio Shack # 900-187
Elite-Calc/3.0 Disk Radio Shack # 900-188

PACKAGES ONLY FROM ELITE SOFTWARE
Specify Disk or Tape
Elite-Calc/3.0 & Calc-List - **$79.95**
Elite-Calc/PBJ for Word-Pak - **$79.95**
The "Original" Elite-Calc (Ver.1.2) NOW - **$34.50**

★ COLOR COMPUTER COMMUNICATIONS ★

Elite•Comm™

Elite•Comm turns your Color Computer into a powerful 300 Baud terminal.

Elite•Comm is SMOOTH operation that's EASY TO USE!

Specify Tape or Disk

$29.95

Not presently available at Radio Shack

Elite Software
NOW AT **Radio Shack** STORES
Available via Express Order
Radio Shack is a trademark of Tandy Corporation

★ COLOR COMPUTER DICTIONARY ★

Elite•Spel™

Elite•Spel is an excellent spelling checker for your Color Computer, and its VERY FAST . . . that's the key. Why wait while a spelling checker does its job? Elite•Spel identifies all potentially misspelled words with a single pass through its perfectly adequate 24,000 word dictionary. Elite•Spel lets you Add or Delete Dictionary words EASILY. Elite•Spel is fully compatible with Elite•Word and will work with ASCII files from other programs.

Speed is the key . . . Elite•Spel has it!

Available on Disk only ***$29.95***

Radio Shack® Catalog # 900-185

When purchased with ELITE•WORD . . . ONLY $15.00

with
FREE
Mail Merge

* COLOR COMPUTER WORD PROCESSOR *

Elite•Word™

Also Available On OS-9

THE SECOND GENERATION WORD PROCESSOR IS HERE! ELITE•WORD is a high performance, all machine language, Full Screen Editor which offers an ease-of-use that is simply incredible. ELITE•WORD has many powerful features not found in other word processors for the Color Computer. ELITE •WORD also offers a printed output flexibility that can handle your sophisticated home and business applications.

LOOK at these features:

Very easy to use • Top screen line reserved for HELP display/Command prompts • Excellent for BOTH program editing and word processing • TWO text entry modes; Insert or Exchange • Auto Key-Repeat • Smooth display scroll for easier proof reading • True Upper/Lower case display with lower case descenders • Hi-Res text "View" mode displays text exactly as it will be printed; including text Justification, Auto Line Centering, dynamic Margin changes, Top and Bottom Margins, Page Numbering, and Page Breaks • Include feature (disk only) permits including several file names within one output document; total document will have sequential page numbering if desired • Fast Disk I/O; no loading of overlay files to slow down operation • Variable Text (Mail Merge) capability for Form Letter generation included FREE!

32K Extended Basic Required for ROM routine calls • Variable TAB stops • User definable Headers and Footers • Smooth cursor movement over text; in any direction (including vertical) • Page Forward or Backward through text • Jump to beginning or end of text • Automatic text centering • Automatic text Word-Wrap if desired • True Block text Move, Delete, or Copy • Delete entire screen line • Backspace and Delete Character • Delete character above cursor • Find a string of characters • Global Replace character string • Two Hi-Res screen displays; 32 x 19 for text entry/editing, 64 x 19 for formatted text viewing • Continuous Memory display • Over 22K file size in 64K machines • Easy generation of ASCII files • Save/Load text files (in ASCII if desired) • Program remembers last File Name loaded or saved, and will write to it by default if desired • All I/O errors trapped and recoverable • Disk commands for Change Drive, Directory and Free Space • Print Format features allow user to specify Left Margin, Line Length, Line Spacing, Top and Bottom Margin, Duplicate Copies, Right-Side text Justification, Page Pause, Page Numbering, and more • Dynamically change any print Format features within text • Imbed Hex codes and printer Font changes within text.

Additional OS-9 version features:
Edit two files simultaneously • Save or Print only a portion of the text buffer • Edit files larger than memory (uses disk as buffer) • Block Copy from one file to another • Execute any OS-9 command from Editor

If you want powerful features AND a program that's EASY TO USE, Elite•Word is for you . . .

Elite•Word TAPE	RS# 900-183
Elite•Word DISK	RS# 900-184
Elite•Word/OS-9	RS# 900-186

THE BEST FOR ONLY

Specify	
Tape	$ 69.95
RS Disk	$ 69.95
OS-9 Disk	$ 79.95
OS-9 & RS Disk	$115.95

> *"Elite•Word is a terrific word processor with an impressive list of features, yet it's easy to learn and use."*
> *—Stuart Hawkinson, HOT COCO*
>
> *"I was more than satisfied with Elite•Word . . . After the review, I would not hesitate to compare it with the two best selling word processors. And my comparison places it at the top of the list."*
> *—A. Buddy Hogan, RAINBOW*

* COLOR COMPUTER DATA BASE MANAGER *

Elite•File™

THIS IS IT! ELITE•FILE is the Data Base Manager that Color Computer users have been waiting for. ELITE•FILE is for everyone who needs to store and retrieve information. ELITE•FILE is a full-featured relational Data Base Manager with all the editing and report formatting features that are typically found on much larger computer systems. COMPARE the others for record structure flexibility, total record capacity, information processing ability, speed of program response, printed output flexibility, and you'll agree that ELITE•FILE may very well be the most powerful/useful program ever written for the Color Computer.

> *"I like Elite•File and would readily recommend it to anyone..Its power and speed have to be seen to be appreciated."*
> *—Ed Lowe, RAINBOW*
>
> *"Elite•File is a very decent program and you can learn to do alot with it in a hurry."*
> *—Scott L. Norman, HOT COCO*

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Paul Freiberger and Michael Swaine. From Osborne/McGraw-Hill, 2600 Tenth Street, Berkeley, CA 94710, $9.95 (paperback). *Hackers: Heroes of the Computer Revolution* by Steven Levy. From Anchor Press/Doubleday, Garden City, NY. $17.95 (hardback). Together, these books present a definitive history of the computer revolution that brought powerful, inexpensive computers to you, to me, to all of us — the people.

THE NEXT Whole Earth Catalog (second edition, 1981). We can't think of a better way to describe this catalog than the way they do it on Page 2: "*THE NEXT Whole Earth Catalog* is an evaluation and access device. With it, the user should know better what is worth getting and where and how to do the getting.

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The catalog is huge, 11 by 14½ by 1¼ inches thick, with 608 pages crammed full of the most interesting information. Get it from Whole Earth Access Company, 2990 Seventh Street, Berkeley, CA 94710. Cost is $16 plus $2 postage and handling (California residents add 6% sales tax).

WHOLE EARTH Review is a periodical from the same people who put out *THE NEXT Whole Earth Catalog.* Once there was *CoEvolution Quarterly*, then came *The Whole Earth Software Review.* Well, now the last two are merged into *WHOLE EARTH Review.* We recommend you get it. A year's subscription is $18 (6 issues) from WHOLE EARTH Review, P.O. Box 27956, San Diego, CA 92128.

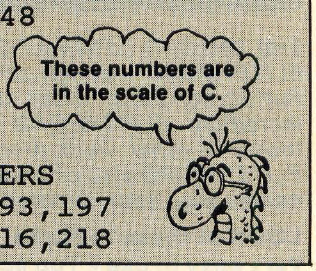
Parents, Kids, and Computers by Lynne Alper and Meg Holmberg — 145 pages of good information for only $4.95. Lynne is a math and computer teacher who has been sharing computer fun and learning with her own children since 1980, when her kids were 5, 7 and 9 years old. Meg is a technical writer and editor who works closely with educators who are developing new ways for children to learn with computers. Get it at your local bookstore or from SYBEX, 2344 Sixth Street, Berkeley, CA 94710.

Sound and Color Organ

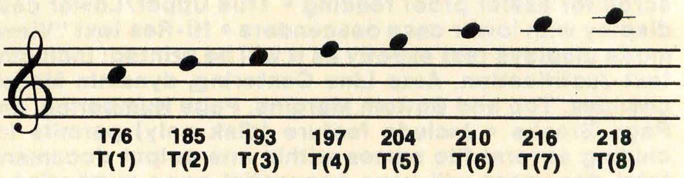
Let's turn the CoCo into a very simple sound and color organ. Your child can play up to eight notes in eight colors using the number keys '1' through '8'.

Listing 1:

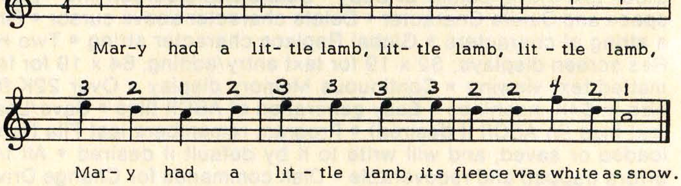
```
100 REM**SOUND & COLOR SCH 18-1
110 CLS
199 '
200 REM**FILL TONE ARRAY
210 FOR K=1 TO 8
220 : READ T(K)
230 NEXT K
299 '
300 REM**TELL HOW TO PLAY
310 PRINT @480, "PRESS A KEY (1
TO 8)";
320 K$=INKEY$: IF K$="" THEN 320
330 IF K$<"1" OR K$>"8" THEN 320
399 '
400 REM**PLAY NOTE & SHOW COLOR
410 K = ASC(K$) - 48
420 CLS K
430 SOUND T(K),1
440 GOTO 310
499 '
900 REM**TONE NUMBERS
910 DATA 176,185,193,197
920 DATA 204,210,216,218
```


These numbers are in the scale of C.

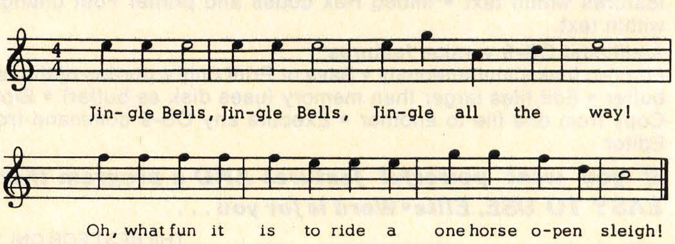
Block 200 loads the tone numbers for the musical scale of C into subscripted variables T(1), T(2), T(3), etc.



Enter and run the program, then let your child press keys. All keys are ignored except the number keys, 1 to 8, and the BREAK key. Here are the numbers to press to play "Mary Had a Little Lamb."


3 2 1 2 3 3 3 2 2 2 3 5 5
Mar-y had a lit- tle lamb, lit- tle lamb, lit - tle lamb,
3 2 1 2 3 3 3 3 2 2 3 2 1
Mar- y had a lit - tle lamb, its fleece was white as snow.

Encore! How about a little ho, ho, ho? Put the numbers above the notes, then help your child play "Jingle Bells."


Jin-gle Bells, Jin-gle Bells, Jin-gle all the way!
Oh, what fun it is to ride a one horse o-pen sleigh!

Make the duration of the tone longer:

```
430 SOUND T(K),10
```

Then try one of these games:

Guess My Tone Number — One person presses a number key; the other person listens and guesses which key was pressed.

Match My Tone — This one is for people with good pitch! One person hums one of the eight tones; the other person matches it by pressing the corresponding number key.

Make A Tune — Take turns pressing a number key and write down the number of the key. After both of you press number keys a bunch of times and write down each one, you have made a tune! Take turns playing the entire tune.

Use Letters for 26 Tones

Using the letter keys A to Z, we can make the CoCo play 26 different tones. We will put the following tones in the array 'T'.

K	T(K)	Note	K	T(K)	Note
1	89	Middle C	14	180	C$^{\#}$, D^{b}
2	99	C$^{\#}$, D^{b}	15	185	D
3	108	D	16	189	D$^{\#}$, E^{b}
4	117	D$^{\#}$, E^{b}	17	193	E
5	125	E	18	197	F
6	133	F	19	200	F$^{\#}$, G^{b}
7	140	F$^{\#}$, G^{b}	20	204	G
8	147	G	21	207	G$^{\#}$, A^{b}
9	153	G$^{\#}$, A^{b}	22	210	A
10	159	A	23	213	A$^{\#}$, B^{b}
11	165	A$^{\#}$, B^{b}	24	216	B
12	170	B	25	218	C
13	176	C	26	221	C$^{\#}$

Press the letter 'A' to play Middle C. Press 'B' to play C sharp or D flat; press 'C' to play D; press 'D' to play D sharp or E flat, and so on.

Our program is quite similar to the previous one.

Listing 2:

```
100 REM**SOUND & COLOR SCH 18-2
110 DIM T(26)
120 CLS
199 '
200 REM**FILL TONE ARRAY
210 FOR K=1 TO 26
220 : READ T(K)
230 NEXT K
299 '
300 REM**TELL HOW TO PLAY
310 PRINT @480, "PRESS A KEY, A
TO Z";
320 K$=INKEY$: IF K$="" THEN 320
330 IF K$<"A" OR K$>"Z" THEN 320
399 '
400 REM**PLAY NOTE & SHOW COLOR
410 K = ASC(K$) - 64
420 CLS K-8*INT((K-1)/8)
430 SOUND T(K),1 ──── Or whatever duration
440 GOTO 310              you want.
499 '
900 REM**TONE NUMBERS
910 DATA 89,99,108,117        )
920 DATA 125,133,140,147      } — 1st octave
930 DATA 153,159,165,170      )
940 DATA 176,180,185,189      )
950 DATA 193,197,200,204      } — 2nd octave
960 DATA 207,210,213,216      )
970 DATA 218,221 ─────────── a little bit more
```

Boggled by Line 420? Perhaps this will help. Remember, 'K' will be an integer from one to 26. Why? (See Line 410.)

K	(K-1)/8	INT((K-1)/8)	K-8*INT((K-1)/8)
1	0	0	1
2	.125	0	2
8	.875	0	8
9	1	1	1
10	1.125	1	2
16	1.875	1	8
17	2	2	1
18	2.125	2	2
24	2.875	2	8
25	3	3	1
26	3.125	3	2

The value of K-8*INT((K-1)/8 will always be an integer in the range one to eight. So, Line 420 will select one of the eight screen colors.

Would you like to change what tone is played by each letter? Easy, just rewrite the `DATA` statements (lines 910-970).

Guess My Number — A Storyboard

Here is a "Guess My Number" game we play with very young children using paper and pencil. First, we write down the numbers from one to nine.

1 2 3 4 5 6 7 8 9

Then, we secretly pick a number. Let's pick seven. The child guesses. Suppose she guesses three. We put a "pointer" above her guess.

```
    >
1 2 3 4 5 6 7 8 9
```

The pointer (>) points toward our secret number. Of course, it also means "greater than." So we say, "My number is greater than three."

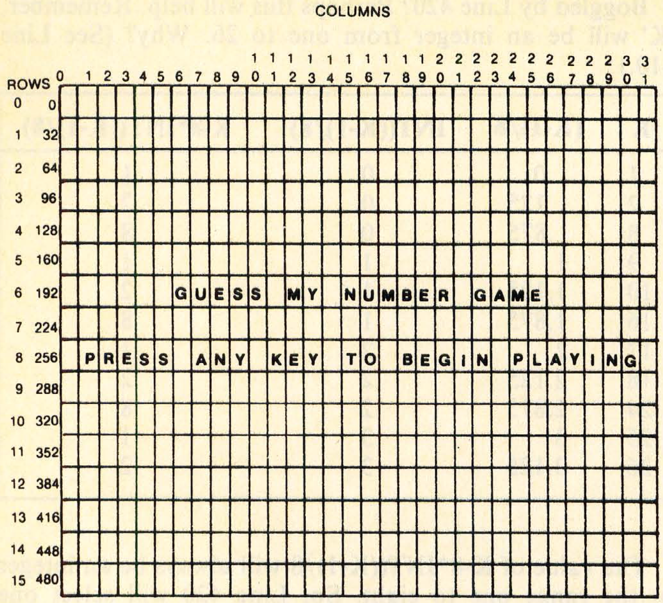
Now suppose she guesses nine. We put a "less than" pointer above '9'.

```
    >           <
1 2 3 4 5 6 7 8 9
```

Aha! Now she will see that my secret number is caught between three and nine. It is greater than three (>3) and less than nine (<9). We continue until she guesses the secret number, and put an equals sign (=) above her correct guess.

Guess Number:			1			3	4		2
Hint:			>			>	=		<
	1	2	3	4	5	6	7	8	9

We challenge *you* to write a CoCo program to play this game with a child. Here is the first screen.



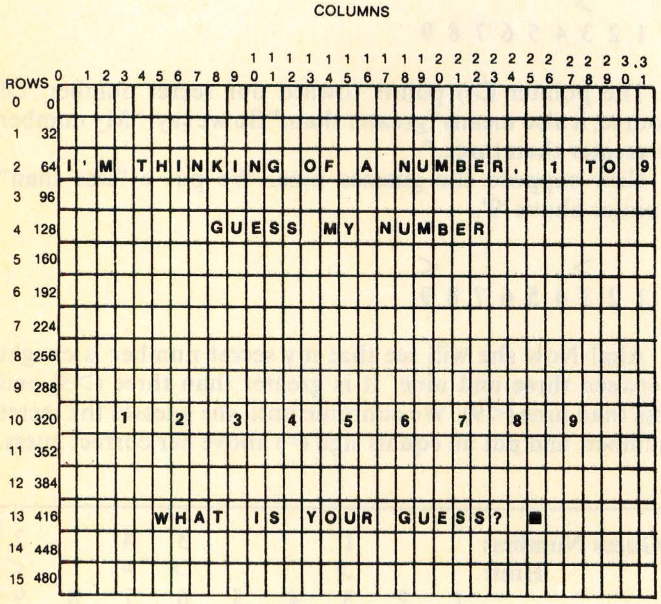
GUESS MY NUMBER GAME

PRESS ANY KEY TO BEGIN PLAYING

While the CoCo is waiting for someone to press a key, "spin" the RND function, like this:

```
line                                              line
number K$=INKEY$:R=RND(0):IF K$="" THEN number
```

When someone presses a key, pick a secret number and show the next screen.



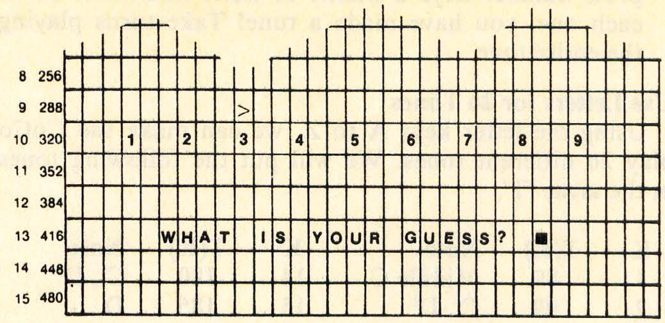
I'M THINKING OF A NUMBER, 1 TO 9

GUESS MY NUMBER

1 2 3 4 5 6 7 8 9

WHAT IS YOUR GUESS? ■

Suppose the secret number is seven and someone guesses three. Put the proper pointer above the '3'.

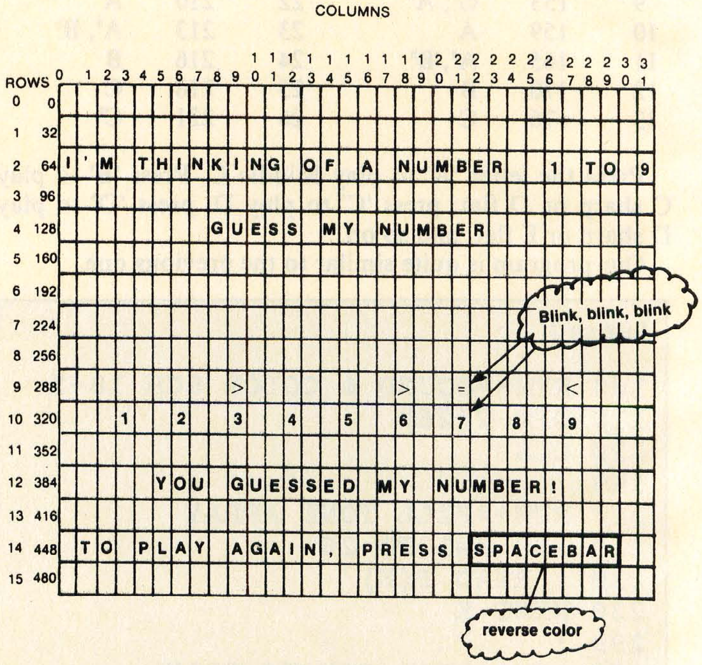


>

1 2 3 4 5 6 7 8 9

WHAT IS YOUR GUESS? ■

And so on. After each guess, put the proper pointer (> or <) above the guess — unless the player guesses the number. In that case, put an equals sign (=) above the correct guess, blink the correct guess and tell how to play again.



I'M THINKING OF A NUMBER 1 TO 9

GUESS MY NUMBER

> > = <

1 2 3 4 5 6 7 8 9

YOU GUESSED MY NUMBER!

TO PLAY AGAIN, PRESS SPACEBAR

Designing a program like this is called *storyboarding*. Use our storyboard to help write the program. Next time we will show you our program.

DragonSmoke and *DragonFun*

DragonSmoke is our newsletter about personal and family learning, including computers, role playing games, play-by-mail games, COPY ME stuff, public domain instructional materials, software for beginners and, our own play-by-mail game, *DragonFun*.

DragonFun is a play-by-mail role playing game for beginners. It is nonviolent and features cooperation, exploration, problem-solving and story-telling. How to play is described in *DragonSmoke*. Teachers: *DragonFun* can be a great class project. We will start a new game in October 1985 specifically for grades four, five and six. Your class enters two characters and guides their adventures by mail once a month throughout the school year.

DragonSmoke has become too big to stuff into self-addressed, stamped envelopes. For a sample copy, send $1 to *DragonSmoke*, P.O. Box 7627, Menlo Park, CA 94026.

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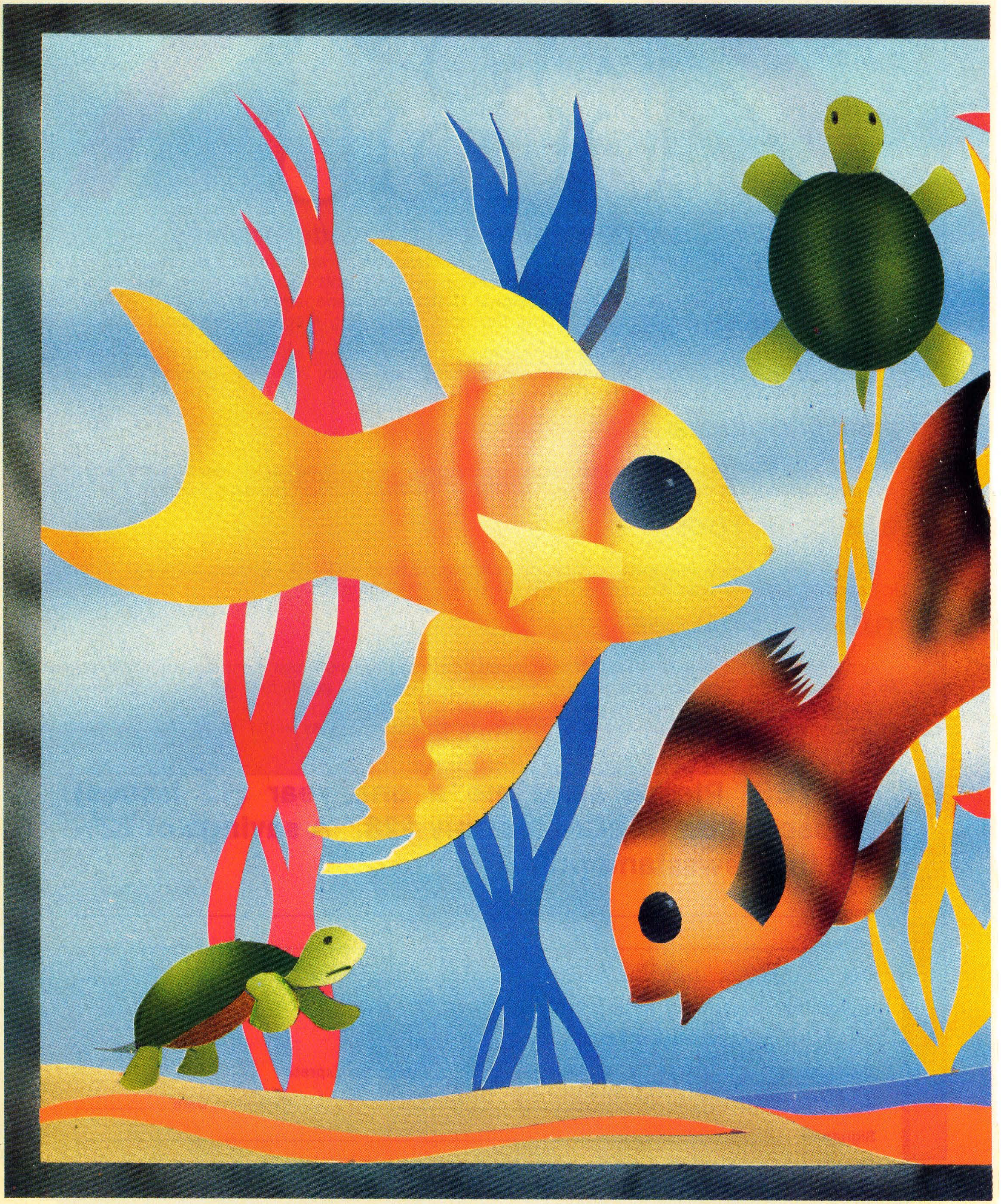

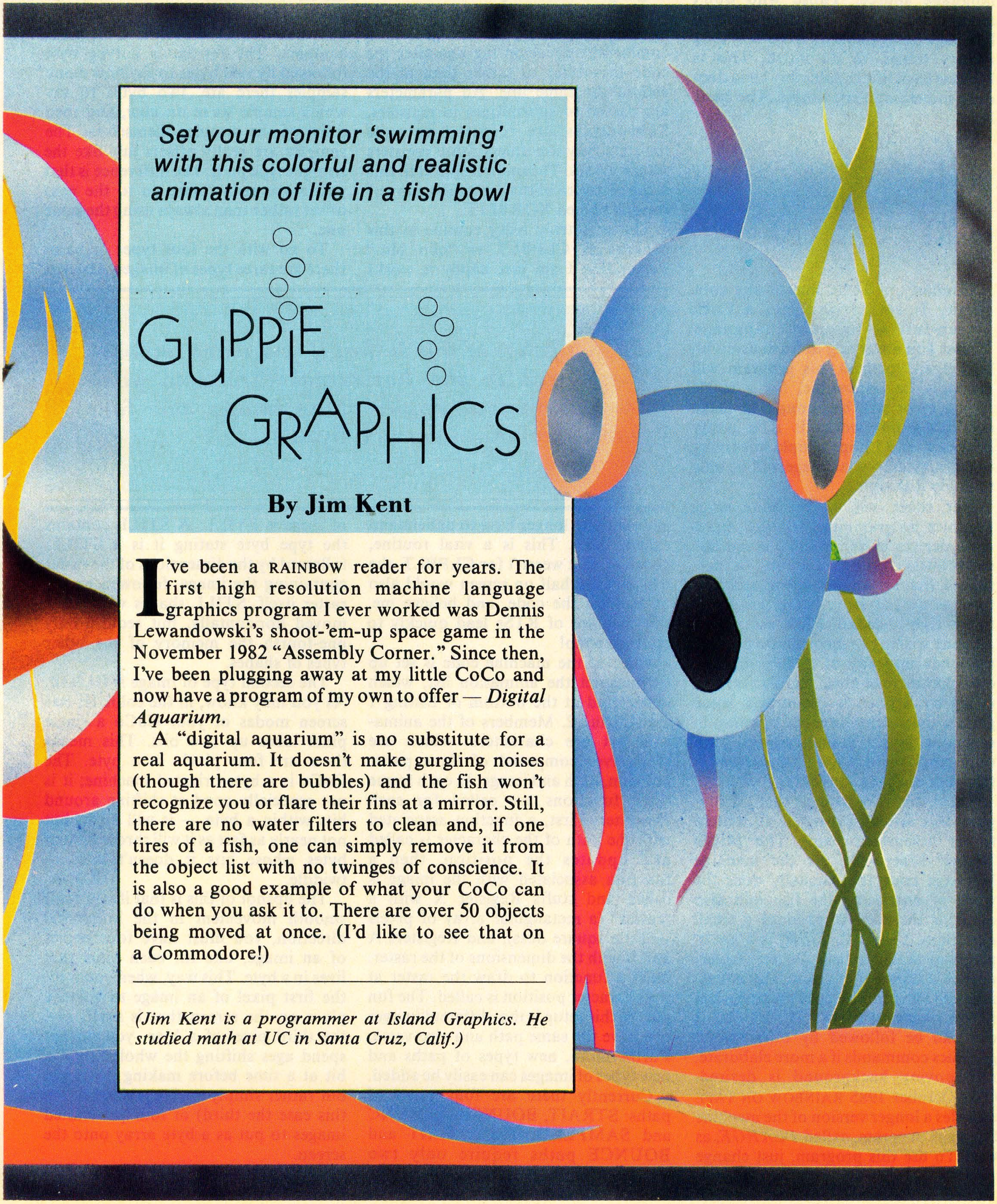

Set your monitor 'swimming' with this colorful and realistic animation of life in a fish bowl

GUPPIE GRAPHICS

By Jim Kent

I've been a RAINBOW reader for years. The first high resolution machine language graphics program I ever worked was Dennis Lewandowski's shoot-'em-up space game in the November 1982 "Assembly Corner." Since then, I've been plugging away at my little CoCo and now have a program of my own to offer — *Digital Aquarium.*

A "digital aquarium" is no substitute for a real aquarium. It doesn't make gurgling noises (though there are bubbles) and the fish won't recognize you or flare their fins at a mirror. Still, there are no water filters to clean and, if one tires of a fish, one can simply remove it from the object list with no twinges of conscience. It is also a good example of what your CoCo can do when you ask it to. There are over 50 objects being moved at once. (I'd like to see that on a Commodore!)

(Jim Kent is a programmer at Island Graphics. He studied math at UC in Santa Cruz, Calif.)

It would really be best to get RAINBOW ON TAPE to enjoy this article. I've included a listing of the assembly language source. Those who don't already know can see that machine language programs tend to be very long if they intend to do much. This is because each line in assembly code does only something very simple. The basic line:

```
i = j + k
```

translates to:

```
lda j
adda k
sta i
```

Similarly, a BASIC line of any complexity is apt to turn into a CoCo screen-full of assembly language. Unless you are trying to learn assembly language, typing in this program will probably be impossible, for a single typing error will be enough to make everything not work. It is a pretty program, and I hope people not trying to learn assembly language will be able to enjoy it as well.

For those who have done some graphics programming, *Digital Aquarium* derives its remarkable speed and smoothness through the use of preshifted shapes, a `DRAW-DRAW` architecture, as well as from being written in fairly tightly-coded 6809 assembler. Anyone wishing to incorporate parts of this code into any of their programs, even commercial ones, should feel free to do so. I hope it encourages some games that *don't* involve missiles in space or jungle munch-'em-ups. My only regret with *Digital Aquarium* is that it doesn't use joysticks — yet.

There are two listings that accompany this article. Listing 1, *F*, written to be assembled using The Micro Works' Macro-80C, is the machine language code that actually does the work of animating the fish and also contains the code to produce a small aquarium. Listing 2, *FISH*, is a BASIC program that uses the *Digital Aquarium* as a `USR ( )` routine. The aquarium will run until a key is pressed, then it will return to BASIC. The `PCLS ( )` call can be followed by other BASIC graphics commands if a more elaborate, non-moving background is desired. (The October 1985 RAINBOW ON TAPE includes a longer version of the machine language program, called *FLARGE*, as well. To use this program, just change Line 20 of Listing 2 to `LOADM "FLARGE"`.

I have tried to document the assembly language as much as possible. I did not have the luxury of an 80-column screen when I developed this program, so comments appear on the line after the code they refer to rather than at the end of the same line. All parameters are passed to subroutines in registers. Subroutines are required to save registers they use unless those registers return values. The one exception to this is the software blitter (rectangle mover) routine named XORBLIT.

The only truly hairy routine in this package is CLPBLT or "clip blit." Personally, I am just happy it works and that I no longer have to understand exactly how. This is a vital routine, however. If it weren't for CLPBLT, the fish that are half on screen would also be half on the code, and believe me, fins in place of RTSs lead quickly to seaweed soup!

> ***"The upshot of this is that if you want smooth movement in the horizontal direction, you must have four copies of an image, one for each pixel that lives in a byte."***

Most of the machine code is set up to interpret the animation list, which is declared at the bottom of Listing 1 and Listing 2. Members of the animation list are characters, which are themselves composed of three parts: position, path and image. In each frame three functions are called for each character. First, a function associated with the path of the character is called and updates the position, then a function associated with the image is called and stuffs Register X with a "raster" (a rectangular array of pixels — little square dots), and Registers A and B with the dimensions of the raster. Next a function to draw the raster at the character position is called. The fun part of this setup is that different images can have the same path and vice-versa. Furthermore, new types of paths and new types of images can easily be added.

Currently there are four types of paths: STRAIT, BOUNCE, YBOUNC and SAMPLED. The STRAIT and BOUNCE paths require only two numbers to define in addition to a "type byte" at the beginning. These are naturally the horizontal and vertical offsets to be added to the character position in each frame.

The SAMPLED path is a bit more complex. The format is a type byte followed by two bytes to say how many samples there are, two bytes to say which sample we're on now, and then a list of the samples themselves. The samples are really offsets just like the straight type path. The difference is that you move each frame on to the next offset rather than always using the same one.

To go with the four types of paths there are three types of images. The first of these is STILL. A STILL contains the type byte stating it is a STILL, followed by the dimensions of the raster containing the image, followed by the raster itself. STILL shapes will jerk if moved horizontally, but require only one-fourth the memory of the other types of shapes.

The second type of image is GLIDE. As you may know, in the color Hi-Res screen modes of your CoCo a single pixel takes up two bits. This means there are four pixels in a byte. The CoCo is a byte-oriented machine; it is not especially good at shifting around bits within a byte — it will do it, but not nearly as fast as it will throw around bytes whose bits it doesn't have to twiddle.

The upshot of this is that if you want smooth movement in the horizontal direction, you must have four copies of an image, one for each pixel that lives in a byte. This way, when you want the first pixel of an image to go to a place on the screen that is itself, say, the third pixel of a byte, you do not spend ages shifting the whole image a bit at a time before making the copy, but rather simply decide which one (in this case the third) of four pre-shifted images to put as a byte array onto the screen.

Therefore, when an image is declared to be type GLIDE you supply the first raster just as if it were a STILL, but then you reserve space for three more copies of the image — pre-shifted copies, for the machine to fill in once it gets going.

The type WIGGLE is very much like GLIDE, except instead of the CoCo doing the pre-shifting you do it yourself. The advantage of this is that without using any more memory than it would take for smooth motion, you can have a shape that wiggles a little as it moves horizontally.

If you don't have RAINBOW ON TAPE, for a copy of the program on disk ($6 and I'll supply disk), fresh shapes to animate or perhaps to engage in a digital fish exchange, contact me at 1001-A O'Reilly, San Francisco, CA 95129. As it stands, the program only works on machines with Extended Color Disk BASIC. To get it to run on a cassette-based system add the line: 25 POKE 3000,8 to Listing 2. This tells it your screen is starting at $800 instead of $E00. It should run on 16K machines with no problem.

The *Digital Aquarium* was written using a Micro Works Macro-80C assembler and editor with local labels. (That's what all the A@'s are, folks.) If you own a less intelligent assembler, I'm afraid you'll have to make up new labels for them. ☐

Listing 1: F

```
0080                XMAX   EQU 128
0060                YMAX   EQU 96
                    *DIMENSIONS OF SCREEN

0E00                       ORG $3000

3000 0E00           SCREEN FDB $E00
                    *POKE IN NEW SCREEN LOCATION
                    *HERE IF WANT TO

3002                       ORG $3010
                    *SKIP A BIT .. ROOM FOR
                    *MORE PARAMETERS FOR LATER
                    *VERSIONS

3010                ZTART
3010 CC0E00                LDD #$E00
3013 FD3000                STD SCREEN
3016 CE330B                LDU #ANLIST
3019 170012                LBSR OBINIT
                    *PRE-SHIFT SHAPES

301C 170088                LBSR DRAALL
                    *DRAW EVERYTHING ONE UP TOP SO
                    *LOOP CAN BE UNDRAW-DRAW INSTEAD
                    *OF DRAW-UNDRAW

301F                LOOP
301F 170098                LBSR FRAME
3022 170223                LBSR INTRPT
3025 27F8                  BEQ LOOP
                    *GO AROUND FOREVER OR UNTIL
                    *USER HITS KEYBOARD

3027 CE330B                LDU #ANLIST
302A 17007A                LBSR DRAALL
                    *FINAL ERASING XOR
302D 39                    RTS
                    *RETURN ALL THE WAY TO BASIC

                    ********************************
                    *
                    *      OBINIT
                    *
                    *INPUT:
                    *      U->CHARACTER LIST
                    *
                    *WILL PROMOTE GLIDE TYPE IMAGES
                    *TO WIGGLE TYPES BY FILLING
                    *IN THE PRESHIFTED IMAGES
                    ********************************
302E 3452           OBINIT PSHS A,U,X

3030 11830000              CMPU #0
                    *JUST TO SET CONDITION CODE
3034 2013                  BRA C@
3036 AEC90004       A@     LDX CIMAGE,U
303A A6890000              LDA ITYPE,X
303E 8102                  CMPA #GLIDE
3040 2603                  BNE B@
3042 170008                LBSR PREGLI
3045 EEC90006       B@     LDU CNEXT,U
3049 26EB           C@     BNE A@

304B 35D2                  PULS A,U,X,PC

                    ********************************
                    *
                    *      PREGLI
                    *
                    *INPUT:
                    *      X->IMAGE
                    *
                    *MAKES 3 SHIFTED VERSIONS
                    *OF RASTER AND ALL STENCILS
                    ********************************
304D                PREGLI
304D 3476                  PSHS X,Y,U,A,B
304F 3276                  LEAS -10,S

3051 8601                  LDA #WIGGLE
3053 A7890000              STA ITYPE,X
                    *PROMOTE TO PRESHIFTED TYPE

3057 EC890001              LDD IXDIM,X
305B EDE4                  STD ,S
                    *SAVE DIMENSIONS

305D EC890003              LDD ILENG,X
3061 ED62                  STD 2,S
                    *SAVE RASTER SIZE

3063 30890005              LEAX IDATA,X
                    *POINT X TO START OF FIRST RASTER
3067 338B                  LEAU D,X
                    *POINT U TO NEXT RASTER

3069 8603                  LDA #3
306B A764                  STA 4,S
                    *COUNT THROUGH THREE RASTERS

306D ECE4           A@     LDD ,S
306F 1CFE                  ANDCC #$FE       CLEAR CARRY
3071 170013                LBSR ASRXU
3074 1F31                  TFR U,X
3076 1CFE                  ANDCC #$FE
3078 17000C                LBSR ASRXU
307B EC62                  LDD 2,S
307D 33CB                  LEAU D,U
307F 6A64                  DEC 4,S
3081 26EA                  BNE A@
                    *SHIFT THE IMAGES

3083 326A           PREANZ LEAS 10,S
3085 35F6                  PULS A,B,X,Y,U,PC

                    ********************************
                    *
                    *      ASRXU
                    *
                    *INPUT:
                    *      X->SOURCE RASTER
                    *      U->DESTINATION RASTER
                    *      A = X DIMENSION OF
                    *            RASTER
                    *      B = Y DIMENSION
                    *
```

```
                        *SHIFTS RASTER RIGHT ONE.
                        *CARRY BIT MUST BE SET ABOVE
                        ********************************
0055 3087 3456          ASRXU  PSHS X,U,A,B
0056 3089 327B                 LEAS -5,S

0057 308B EDE4                 STD ,S
0058 308D 1FA9                 TFR CC,B
0059 308F E762                 STB.2,S

0060 3091 E662          ASRXU1 LDB 2,S
0061 3093 1F9A                 TFR B,CC
                        *PUT CARRY BIT IN RIGHT PLACE
0062 3095 E680          A@     LDB ,X+
0063 3097 56                   RORB
0064 3098 E7C0                 STB ,U+
0065 309A 4A                   DECA
0066 309B 26F8                 BNE A@
                        *SHIFT ONE LINE
0067 309D A6E4                 LDA ,S
0068 309F 6A61                 DEC 1,S
0069 30A1 26EE                 BNE ASRXU1


                        *SHIFT RASTER

0070 30A3 3265                 LEAS 5,S
0071 30A5 35D6                 PULS X,U,A,B,PC

                        ********************************
                        *
                        *      DRAALL
                        *
                        *INPUT:
                        *      U->CHARACTER LIST
                        *
                        ********************************
0072 30A7               DRAALL
0073 30A7 3440                 PSHS U
0074 30A9 11830000             CMPU #0
0075 30AD 2007                 BRA C@
0076 30AF 170038        A@     LBSR DRAOBJ
0077 30B2 EEC90006             LDU CNEXT,U
0078 30B6 26F7          C@     BNE A@

0079 30B8 35C0                 PULS U,PC


                        ********************************
                        *
                        *      FRAME
                        *
                        *INPUT:
                        *      U-> START OF CHARACTER
                        *            LIST
                        ********************************
0080 30BA 3440          FRAME  PSHS U
0081 30BC 11830000             CMPU #0
0082 30C0 200D                 BRA C@
0083 30C2 170025        A@     LBSR DRAOBJ
                        *ERASE XOR IMAGE
0084 30C5 17000B               LBSR MOVOBJ
0085 30C8 17001F               LBSR DRAOBJ
                        *ACTUALLY DRAW THE THING
0086 30CB EEC90006             LDU CNEXT,U
0087 30CF 26F1          C@     BNE   A@
0088 30D1 35C0                 PULS U,PC

                        ********************************
                        *
                        *      MOVOBJ
                        *
                        *INPUT:
                        *      U->CHARACTER
                        *
                        *MOVES CHARACTER
                        *FORWARD ONE 'CLICK' IN TIME
                        ********************************
0089 30D3 3436          MOVOBJ PSHS D,X,Y
0090 30D5 10AEC90002           LDY CPATH,U
0091 30DA A6A90000             LDA PTYPE,Y
0092 30DE 48                   LSLA
0093 30DF 8E3104               LDX #NOFFT
0094 30E2 AD96                 JSR [A,X]
                        *LOOK UP FUNCTION THAT
                        *MOVES THIS TYPE OF OBJECT
0095 30E4 EDC90000             STD CXPOS,U
                        *AND STORE FUNCTION RESULT
                        *IN OBJECT POSITION

0096 30E8 35B6                 PULS X,Y,D,PC
```

```
                        ********************************
                        *
                        *      DRAOBJ
                        *
                        *INPUT:
                        *      U->CHARACTER
                        ********************************
0097 30EA 3436          DRAOBJ PSHS A,B,Y,X
0098 30EC 10AEC90004           LDY CIMAGE,U
0099 30F1 A6A90000             LDA ITYPE,Y
0100 30F5 48                   LSLA
0101 30F6 8E310C               LDX #DOBJT
0102 30F9 AD96                 JSR [A,X]
                        *CALL FUNCTION TO GET NEXT
                        *RASTER AND STENCIL
0103 30FB ECC90000             LDD CXPOS,U
                        *GET CURRENT POSITION
0104 30FF 17008C               LBSR CLPBLT

0105 3102 35B6                 PULS A,B,X,Y,PC



0106 3104 3145316B31    NOFFT  FDB NEWBOU,NEWSMP,NEWSTR
0107 310A 3134                 FDB NEWYBC

0108 310C 31103115      DOBJT  FDB DSTILL,DWIGGL

                        ********************************
                        *
                        *      DSTILL
                        *
                        *INPUT Y->IMAGE
                        *      U->CHARACTER
                        *
                        *OUTPUT X->RASTER
                        *
                        *DRAW A STILL OBJECT
                        ********************************
0109 3110               DSTILL
0110 3110 30A90005             LEAX IDATA,Y
0111 3114 39                   RTS

                        ********************************
                        *
                        *      DWIGGLE
                        *
                        *INPUT Y->IMAGE
                        *      U->CHARACTER
                        *
                        *OUTPUT X->RASTER
                        *
                        *DRAW AN OBJECT CAPABLE OF
                        *SMOOTH MOVEMENT, IE WITH
                        *4 PRESHIFTED SHAPES
                        ********************************
0112 3115               DWIGGL
0113 3115 3406                 PSHS A,B
0114 3117 30A90005             LEAX IDATA,Y
                        *POINT X TO START OF FIRST
                        *RASTER

0115 311B E6C90000             LDB CXPOS,U
0116 311F C403                 ANDB #3
                        *FIND WHICH PIXEL IN BYTE

0117 3121 5C                   INCB
0118 3122 3404                 PSHS B
                        *AND PUSH IT TO USE AS COUNTER

0119 3124 ECA90003             LDD ILENG,Y

0120 3128 2002                 BRA C@
0121 312A 308B          A@     LEAX D,X
0122 312C 6AE4          C@     DEC ,S
0123 312E 26FA                 BNE A@

0124 3130 3504                 PULS B
                        *CLEAR COUNTER

0125 3132 3586                 PULS A,B,PC

                        ********************************
                        *
                        *      NEWYBC
                        *
                        *NEW Y BOUNCE.
                        *
                        *INPUT:
                        *      U->CHARACTER
                        *       Y->PATH
                        *
                        *OUTPUT:
                        *       A=XPOS
                        *       B=YPOS
                        *
0126 3134               NEWYBC
0127 3134 ECC90000              LDD CXPOS,U
0128 3138 AB21                  ADDA 1,Y
0129 313A EB22          A@      ADDB 2,Y
0130 313C C160                  CMPB #YMAX
0131 313E 2504                  BLO Z@
0132 3140 6022                  NEG 2,Y
0133 3142 20F6                  BRA A@
0134 3144               Z@

0135 3144 39                    RTS
                        ******************************
                        *
                        *       NEWBOU
                        *
                        *INPUT:
                        *       U->CHARACTER
                        *       Y->PATH
                        *
                        *OUTPUT:
                        *       A = X POSITION
                        *       B = Y POSITION
                        *
                        *UPDATES BOUNCE POSITION,
                        *AND CHANGES DIRECTION AT WALLS
                        ******************************
0136 3145               NEWBOU

0137 3145 A6C90000      NBX     LDA CXPOS,U     XPOSITION
0138 3149 AB21                  ADDA 1,Y        XSPEED
0139 314B 817B                  CMPA #XMAX-5
0140 314D 2504                  BLO NBXOK
0141 314F 6021                  NEG 1,Y         BOUNCE
0142 3151 20F2                  BRA NBX
0143 3153               NBXOK
0144 3153 E6C90001      A@      LDB CYPOS,U     YPOS
0145 3157 EB22                  ADDB 2,Y        YSPEED
0146 3159 C15B                  CMPB #YMAX-5
0147 315B 2504                  BLO Z@
0148 315D 6022                  NEG 2,Y
0149 315F 20F2                  BRA A@
0150 3161                       Z@

0151 3161 39                    RTS

                        ******************************
                        *
                        *       NEWSTR
                        *
                        *INPUT:
                        *       U->CHARACTER
                        *       Y->PATH
                        *OUTPUT:
                        *       A = X POSITION
                        *       B = Y POSITION
                        *
                        *GET NEXT POSITION FOR A
                        *STRAIGHT PATH CHARACTER
                        ******************************
0152 3162               NEWSTR
0153 3162 ECC90000              LDD   CXPOS,U
0154 3166 AB21                  ADDA 1,Y
0155 3168 EB22                  ADDB 2,Y
0156 316A 39                    RTS

                        ******************************
                        *
                        *       NEWSMP
                        *
                        *INPUT:
                        *       U->CHARACTER
                        *       Y->PATH
                        *
                        *OUTPUT:
                        *       A = XPOS
                        *       B = YPOS
                        *
```

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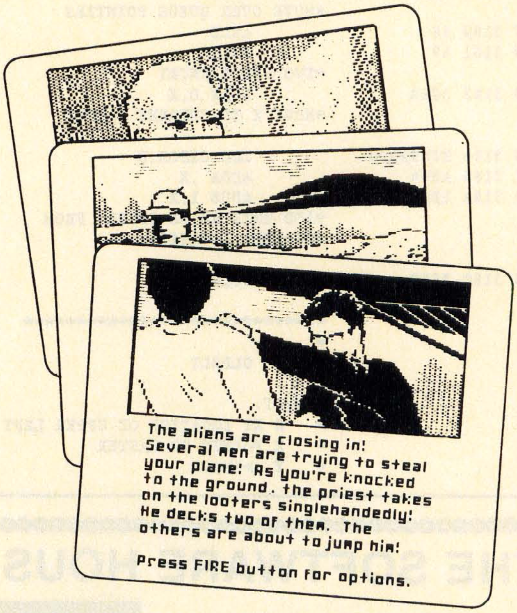

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```
                    *UPDATES POSITION OF CHARACTER
                    *BASED ON A OFFSET LIST TYPE
                    *PATH
                    ******************************
0157 316B           NEWSMP
0158 316B 3410              PSHS X

0159 316D 3021              LEAX 1,Y
0160 316F EC84              LDD ,X
0161 3171 C30001            ADDD #1
0162 3174 10A302            CMPD 2,X
0163 3177 2503              BLO A@
0164 3179 CC0000            LDD #0
0165 317C ED84      A@      STD ,X
                    *UPDATE POINTER TO NEXT SAMPLE
                    *AND MOVING POINTER BACK TO
                    *START IF PAST END

0166 317E 3004              LEAX 4,X
                    *MOVE OVER QUEUE POINTERS
0167 3180 58                LSLB
0168 3181 49                ROLA
                    *TWO BYTES/ENTRY
0169 3182 308B              LEAX D,X
                    *MOVE X TO CURRENT SAMPLE

0170 3184 ECC90000          LDD CXPOS,U
0171 3188 AB84              ADDA ,X
0172 318A EB01              ADDB 1,X
                    *ADD THIS AS AN OFFSET FROM
                    *CURRENT LOCATION

0173 318C 3590              PULS X,PC

                    ******************************
                    *
                    *       CLPBLT
                    *
                    *INPUT:
                    *    D XY LOCATION OF UPPER LEFT
                    *    X POINTS TO RASTER
                    *    Y ->IMAGE
```

```
                    *
                    *CLIPS RASTER TO SCREEN AND
                    *THEN CALLS XORBLT TO
                    *ACTUALLY DRAW IT
                    ******************************
0174 318E 3476      CLPBLT PSHS A,B,U,X,Y
0175 3190 3271             LEAS -15,S

0176 3192 3365             LEAU 5,S        U TO STACK AREA
0177 3194 EDE4             STD ,S
                    *SAVE UPPER LEFT POS.OF RASTER

0178 3196           CLPVER
0179 3196 E622             LDB 2,Y
0180 3198 E7C4             STB ,U          # OF LINES
0181 319A AF46             STX 6,U         RASTER START
                    *START OFF OPTIMISTIC, INITIAL-
                    *IZE THINGS FOR NO CLIPPING

0182 319C A661      CLPUP  LDA 1,S
0183 319E A762             STA 2,S
0184 31A0 2A1A             BPL CLPDN
                    *IF BELOW TOP OF SCREEN OK
0185 31A2 ABC4             ADDA ,U
0186 31A4 102B007F         LBMI BLITZ
0187 31A8 1027007B         LBEQ BLITZ
0188 31AC A7C4             STA ,U          LESS LINES
                    *DON'T BOTHER IF COMPLETELY
                    *OFF THE TOP
0189 31AE 40               NEGA
0190 31AF AB22             ADDA 2,Y
0191 31B1 E621             LDB 1,Y         RASTER WIDTH
0192 31B3 3D               MUL
0193 31B4 E346             ADDD 6,U
0194 31B6 ED46             STD 6,U
                    *MOVE RASTER POINTER FORWARD ONE
                    *RASTER WIDTH FOR EACH PIXEL
                    *ABOVE SCREEN
                    *IE "CLIP UPWARDS"
0195 31B8 6F62             CLR 2,S         YCOOR SCREEN 0
0196 31BA 2016             BRA CLPHOR

0197 31BC A661      CLPDN  LDA 1,S         UPPER BOUND OF RA
0198 31BE           STER
0199 31BE AB22             ADDA 2,Y        HEIGTH OF RASTER
0200 31C0 8060             SUBA #YMAX
0201 31C2 250E             BLO CLPHOR
                    *IF BOTTOM OF OBJECT IN SCREEN
                    *NO PROBLEM
0202 31C4 8660             LDA #YMAX
0203 31C6 A061             SUBA 1,S
0204 31C8 102B005B         LBMI BLITZ
0205 31CC 10270057         LBEQ BLITZ
                    *IF TOP OF OBJECT BELOW SCREEN
                    *NOTHINGTO DRAW
0206 31D0 A7C4             STA ,U
                    *ELSE STORE ACTUAL # OF LINES
                    *OF OBJECT ON SCREEN
0207 31D2           CLPHOR
0208 31D2 E621             LDB 1,Y         RASTER WIDTH
0209 31D4 E741             STB 1,U         TO BLAT WIDTH
                    *START OPTIMISTIC W/ NO CLIPPING

0210 31D6 E6E4      CLPLF  LDB ,S          ABSOLUTE X POSN
0211 31D8 57               ASRB
0212 31D9 57               ASRB            FROM PIXEL TO BYTE
0213 31DA E7E4             STB ,S          X BYTE POSITION
0214 31DC E763             STB 3,S         XPOSN AFTER CLIP
0215 31DE 2A18             BPL CLPRT
                    *IF POSITIVE THEN NOT TOO FAR
                    *LEFT
0216 31E0 C1C0             CMPB #$C0       HALF WRAP-AROUN
0217 31E2 2514             BLO CLPRT
                    *IF THINK WAY POSITIVE INSTEAD
                    *OF JUST NEGATIVE HAND IT TO
                    *RIGHT CLIPPING
0218 31E4 EB21             ADDB 1,Y        RASTER WIDTH
0219 31E6 2B3F             BMI BLITZ
0220 31E8 273D             BEQ BLITZ
                    *IF EVEN RIGHT BYTE NEGATIVE
                    *DON'T EVEN BLIT
0221 31EA E741             STB 1,U         BLAT WIDTH
0222 31EC 50               NEGB
0223 31ED EB21             ADDB 1,Y        B HAS MODULO
0224 31EF AE46             LDX 6,U         RASTER START
0225 31F1 3A               ABX
0226 31F2 AF46             STX 6,U         ADD TO RASTER PT
                    *ELSE ADJUST WIDTH AND MODULUS
                    *(SKIP WIDTH) FOR RASTER, AND
                    *MOVE RASTER POINTER FORWARD
                    *TO FIRST BYTE ACTUALLY DRAWN
```

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- Un-DISK should be in the library of every serious CoCo user even if you own a disk says Frank J. Esser, independent reviewer for RAINBOW Magazine!

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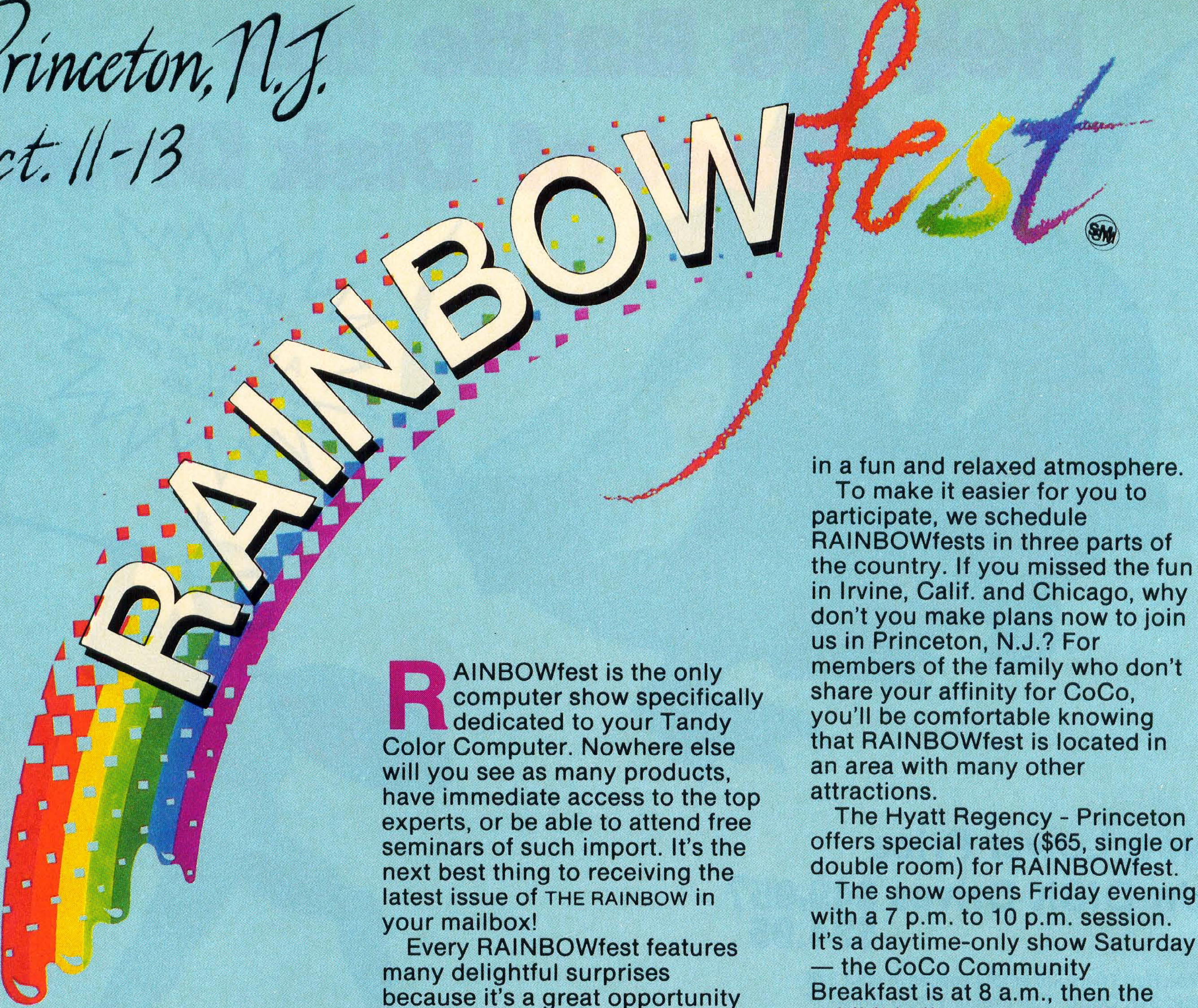

Show Schedule:

Friday evening — Exhibits open from 7 p.m. to 10 p.m.

Saturday — CoCo Community Breakfast at 8 a.m.
Exhibits open at 10 a.m. and close at 6 p.m.

Sunday — Exhibits open from 11 a.m. to 4 p.m.

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You can set your own pace between visiting exhibits and attending valuable, free seminars on all aspects of your CoCo — from improving BASIC skills to working with the sophisticated OS-9 operating system.

Many of the persons who write for THE RAINBOW — as well as those who are written about — are there to meet you and answer your questions, technical and otherwise. You also will meet lots of other people, just like you, who share your interest in the Color Computer. It's a person-to-person event, as well as a tremendous learning experience, in a fun and relaxed atmosphere.

To make it easier for you to participate, we schedule RAINBOWfests in three parts of the country. If you missed the fun in Irvine, Calif. and Chicago, why don't you make plans now to join us in Princeton, N.J.? For members of the family who don't share your affinity for CoCo, you'll be comfortable knowing that RAINBOWfest is located in an area with many other attractions.

The Hyatt Regency - Princeton offers special rates ($65, single or double room) for RAINBOWfest.

The show opens Friday evening with a 7 p.m. to 10 p.m. session. It's a daytime-only show Saturday — the CoCo Community Breakfast is at 8 a.m., then the exhibit hall opens promptly at 10 a.m. and runs continuously until 6 p.m. (There will be no exhibition hours or seminars Saturday evening.) On Sunday, the exhibit hall opens at 11 a.m. and closes at 4 p.m.

Tickets for RAINBOWfest may be obtained directly from THE RAINBOW. We'll also send you a special reservation form so you can get your special room rate.

Come to RAINBOWfest! Let's all celebrate the CoCo Community!

PCMfest Your admission to RAINBOWfest also entitles you to visit the premiere of PCMfest! It's a brand new show focusing on Tandy's new generation of computers — the Tandy MS-DOS computers and the Tandy Portables.

PCMfest is sponsored by our sister publication, PCM, *The Personal Computing Magazine for Tandy Computer Users.*

Keynote Speaker

Our guest speaker for the 8 a.m. CoCo Community Breakfast on Saturday is Bill Barden, one of the country's most widely read computer authors. In addition to hundreds of articles, Bill has written 30 books, including *TRS-80 Assembly Language Programming*, *Color Computer Assembly Language Programming* and *Color Computer Graphics*. Bill will discuss "Where We've Been, And Where We're Going." (Separate tickets are required.)

Free Seminars

Bill Barden — **Computer Languages**

As well as keynoting our CoCo Community Breakfast (Saturday at 8 a.m.), Bill will hold a seminar discussing the right language for your application. His overview will cover the most popular microcomputer languages, including BASIC, C, PASCAL and Assembly.

Dennis Kitsz — **Your Own Color Computer Hardware**

Dennis Kitsz, RAINBOW's newest contributing editor, is a composer, veteran hardware and software designer and president of Green Mountain Micro. His new column in our RainbowTech section debuts in this issue.

Paul Hoffman — **A CoCo Gallery**

Paul Hoffman is an independent designer/artist and Color Computer programmer. He is the author of *Master Artist* and other graphics programs from Owl-Ware.

Dale L. Puckett — **Beginners Tour of OS-9**
also, Beginners Tour of BASIC09

The author of *The Complete Rainbow Guide To OS-9* and *The Official BASIC09 Tour Guide* will discuss the advantages of the BASIC09 language, explain the available commands and demonstrate various functions. He also will give an overview of how to use the multitasking OS-9 operating system. Dale will be autographing copies of *The Complete Rainbow Guide To OS-9*.

Dan Downard — **Q & A on Peripherals and Modifications**
also, Inside Your Color Computer

Dan Downard is the technical editor for THE RAINBOW and an electrical engineer. He has been involved in electronics for 25 years through ham radio (K4KWT). His interest in computers began about six years ago and he has built several 68XX systems.

Steve Blyn — **The CoCo and Special Education**

Steve Blyn teaches both exceptional and gifted children and has won awards for the design of programs to aid the handicapped. He is the author of the THE RAINBOW's "Education Notes" column. He and his wife, Cheryl, own Computer Island.

Join us at future RAINBOWfests!

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Advance ticket deadline: Oct. 4, 1985. Orders received less than two weeks prior to show opening will be held for you at the door. Tickets will also be available at the door at a slightly higher price. Tickets will be mailed six weeks prior to show.

```
0227 31F4 6F63              CLR 3,S
                    *START SCREEN AT LEFT
0228 31F6 200C              BRA ALLCLP

0229 31F8           CLPRT
0230 31F8 8620              LDA #XMAX/4
0231 31FA A0E4              SUBA ,S
0232 31FC 2B29              BMI BLITZ
                    *ALL THE WAY OFF SCREEN
0233 31FE A121              CMPA 1,Y
0234 3200 2402              BHS ALLCLP
                    *ALL IN SCREEN
0235 3202 A741              STA 1,U          BYTES/LINE

0236 3204           ALLCLP
                    *END OF CLIPPING..WHEW!
0237 3204 A662              LDA 2,S          Y DEST.
0238 3206 C620              LDB #32
0239 3208 3D                MUL
0240 3209 F33000            ADDD SCREEN
0241 320C 1F01              TFR D,X
0242 320E E663              LDB 3,S          X DEST.
0243 3210 3A                ABX
                    *X POINTS TO DESTINATION ON
                    *SCREEN

0244 3211 AF44              STX 4,U          SCREEN START

0245 3213 EC46              LDD 6,U          RASTER START
0246 3215 E323              ADDD 3,Y         RASTER LENGTH
0247 3217 ED48              STD 8,U          STENCIL START

0248 3219 8620              LDA #32
0249 321B A041              SUBA 1,U         LINE LENGTH
0250 321D A742              STA 2,U          SCREEN MODULO

0251 321F A621              LDA 1,Y          RASTER WIDTH
0252 3221 A041              SUBA 1,U         LINE LENGTH
0253 3223 A743              STA 3,U          RASTER MODULO

0254 3225 8D04              BSR XORBLT

0255 3227           BLITZ
0256 3227 326F              LEAS 15,S
0257 3229 35F6              PULS A,B,U,X,Y,PC

                    ******************************
                    *
                    *       XORBLIT
                    *
                    *INPUT: U->
                    *     ,U LINES IN RASTER
                    *    1,U #OF LINES IN RASTER
                    *    2,U SCREEN MODULUS
                    *    3,U RASTER MODULUS
                    *    4,U SCREEN START
                    *    6,U RASTER START
                    *
                    *XORS SOURCE WITH DEST,
                    *TRASHES ALL REGISTER AS WELL
                    *AS INPUT STRUCTURE.
                    *THIS IS OK - CLPBLT EXPECTS IT
                    ******************************
0258 322B           XORBLT
0259 322B AE44              LDX 4,U
0260 322D 10AE46            LDY 6,U
0261 3230 E641      A@      LDB 1,U
0262 3232 A684      B@      LDA ,X
0263 3234 A8A0              EORA ,Y+
0264 3236 A780              STA ,X+
0265 3238 5A                DECB
0266 3239 26F7              BNE B@
0267 323B A642              LDA 2,U
0268 323D 3086              LEAX A,X
0269 323F A643              LDA 3,U
0270 3241 31A6              LEAY A,Y
0271 3243 6AC4              DEC ,U
0272 3245 26E9              BNE A@
0273 3247 39                RTS

                    ******************************
                    *
                    *       INTERRUPT
                    *
                    *CHECKS FOR KEYBOARD OR PENDOWN
                    *RETURNS EQ FOR NO KEYBOARD OR
                    *NEW PENDOWN
                    ******************************
0274 3248           INTRPT
0275 3248 3412              PSHS X,A
0276 324A 4F                CLRA
0277 324B B7FF02            STA $FF02
0278 324E B6FF00            LDA $FF00
0279 3251 8A80              ORA #$80
0280 3253 43                COMA
0281 3254 3592              PULS X,A,PC

0282 3256           ZENDCD
                    *END CODE
0283 0000           BOUNCE EQU 0
0284 0001           SAMPLE EQU 1
0285 0002           STRAIT EQU 2
0286 0003           YBOUNC EQU 3
                    *PATH TYPES

0287 0000           STILL  EQU 0
0288 0001           WIGGLE EQU 1
0289 0002           GLIDE  EQU 2
                    *IMAGE TYPES

                    **
                    **
                    **PATH STRUCTURE
                    **
                    **
0290 0000           PTYPE  EQU 0
                    *THE REST DEPENDS ON WHAT
                    *TYPE OF PATH

0291 3256 00        BPATH0 FCB BOUNCE
0292 3257 FE01             FCB -2,1

0293 3259 00        BPATH1 FCB BOUNCE
0294 325A 01FF             FCB 1,-1         INITIAL DIR

0295 325C 00        BPATH2 FCB BOUNCE
0296 325D 01FF             FCB 1,-1

0297 325F 00        BPATH3 FCB BOUNCE
0298 3260 01FF             FCB 1,-1

0299 3262 00        BPATH4 FCB BOUNCE
0300 3263 05FE             FCB 5,-2
```

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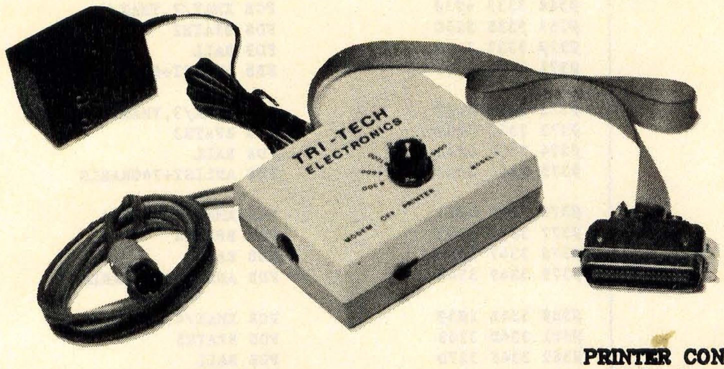

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```
0301 3265 00            BPATH5 FCB BOUNCE
0302 3266 01FF                 FCB 1,-1

0303 3268 00            BPATH6 FCB BOUNCE
0304 3269 0301                 FCB 3,1

0305 326B 00            BPATH7 FCB BOUNCE
0306 326C 0100                 FCB 1,0

0307 326E 00            BPATH8 FCB BOUNCE
0308 326F FF01                 FCB -1,1

0309 3271 00            BPATH9 FCB BOUNCE
0310 3272 FF01                 FCB -1,1

0311 3274 03            YBOUN1 FCB YBOUNC
0312 3275 FE01                 FCB -2,1

0313 3277 03            YBOUN2 FCB YBOUNC
0314 3278 FF01                 FCB -1,1

0315 327A 03            YBOUN3 FCB YBOUNC
0316 327B FF01                 FCB -1,1

                        **
                        **IMAGE STRUCTURE
                        **
0317 0000               ITYPE  EQU 0
                        *STILL, GLIDE, OR WIGGLE
0318 0001               IXDIM  EQU 1
                        *IN BYTES = 4 TIMES PIXELS
0319 0002               IYDIM  EQU 2
                        *# OF LINES - IN PIXELS
0320 0003               ILENG  EQU 3
                        *ALWAYS = IXDIM*IYDIM
0321 0005               IDATA  EQU 5
                        *START OF RASTER(S)

0322 327D 02            BALL   FCB GLIDE
0323 327E 0305                 FCB 3,5          DIMENSIONS
0324 3280 000F                 FDB 15           LENGTH IN BYTES
0325 3282 00FF00               FCB 0,$FF,0
0326 3285 03FFC0               FCB 3,$FF,$C0
0327 3288 03FFC0               FCB 3,$FF,$C0
0328 328B 03FFC0               FCB 3,$FF,$C0
0329 328E 00FF00               FCB $0,$FF,0

0330 3291                      RMB 15*3

0331 32BE 02            GUPPY  FCB GLIDE
0332 32BF 0306                 FCB 3,6
0333 32C1 0012                 FDB 18

0334 32C3 00A000               FCB $00,$A0,$00
0335 32C6 020000               FCB $02,$00,$00
0336 32C9 2A8A00               FCB $2A,$8A,$00
0337 32CC B56000               FCB $B5,$60,$00
0338 32CF 2A8800               FCB $2A,$88,$00
0339 32D2 000280               FCB $00,$02,$80

0340 32D5                      RMB 3*18
                        *SPACE FOR SHIFTED IMAGES

                        **
                        **  CHARACTER STRUCTURE
                        **
0341 0000               CXPOS  EQU 0
0342 0001               CYPOS  EQU 1
0343 0002               CPATH  EQU 2
0344 0004               CIMAGE EQU 4
0345 0006               CNEXT  EQU 6
                        *OFFSETS WITHIN CHARACTER
                        *STRUCTURE
0346 0008               CHARLN EQU 8
                        *LENGTH OF CHARACTER STRUCTURE

0347 330B               ANLIST
0348 330B 1621                 FCB 22,33
0349 330D 3274                 FDB YBOUN1
0350 330F 32BE                 FDB GUPPY
0351 3311 3313                 FDB ANLIST+CHARLN

0352 3313 1A19                 FCB 26,25
0353 3315 3277                 FDB YBOUN2
0354 3317 32BE                 FDB GUPPY
0355 3319 331B                 FDB ANLIST+2*CHARLN

0356 331B 1716                 FCB 23,22
0357 331D 327A                 FDB YBOUN3
0358 331F 32BE                 FDB GUPPY
0359 3321 3323                 FDB ANLIST+3*CHARLN

0360 3323 2A30                 FCB XMAX/3,YMAX/2
0361 3325 3256                 FDB BPATH0
0362 3327 327D                 FDB BALL
0363 3329 332B                 FDB ANLIST+4*CHARLN

0364 332B 4020                 FCB XMAX/2,YMAX/3
0365 332D 3259                 FDB BPATH1
0366 332F 327D                 FDB BALL
0367 3331 3333                 FDB ANLIST+5*CHARLN

0368 3333 4030                 FCB XMAX/2,YMAX/2
0369 3335 325C                 FDB BPATH2
0370 3337 327D                 FDB BALL
0371 3339 333B                 FDB ANLIST+6*CHARLN

0372 333B 2A20                 FCB XMAX/3,YMAX/3
0373 333D 325F                 FDB BPATH3
0374 333F 327D                 FDB BALL
0375 3341 3343                 FDB ANLIST+7*CHARLN

0376 3343 4018                 FCB XMAX/2,YMAX/4
0377 3345 3262                 FDB BPATH4
0378 3347 327D                 FDB BALL
0379 3349 334B                 FDB ANLIST+8*CHARLN

0380 334B 2030                 FCB XMAX/4,YMAX/2
0381 334D 3265                 FDB BPATH5
0382 334F 327D                 FDB BALL
0383 3351 3353                 FDB ANLIST+9*CHARLN

0384 3353 2A18                 FCB XMAX/3,YMAX/4
0385 3355 3268                 FDB BPATH6
0386 3357 327D                 FDB BALL
0387 3359 335B                 FDB ANLIST+10*CHARLN

0388 335B 2020                 FCB XMAX/4,YMAX/3
0389 335D 326B                 FDB BPATH7
0390 335F 327D                 FDB BALL
0391 3361 3363                 FDB ANLIST+11*CHARLN
0392 3363 2018                 FCB XMAX/4,YMAX/4
0393 3365 326E                 FDB BPATH8
0394 3367 327D                 FDB BALL
0395 3369 336B                 FDB ANLIST+12*CHARLN

0396 336B 4013                 FCB XMAX/2,YMAX/5
0397 336D 3271                 FDB BPATH9
0398 336F 327D                 FDB BALL
0399 3371 0000                 FDB 0            END OF LIST



0400 3373               ZENDDA
                        *END DATA

0401 3373                      END
```

Listing 2: FISH

```
10 CLEAR 50,&H3000
20 LOADM"F
30 PMODE1,1
40 PCLS(1)
50 DEFUSR0 = &H3010
60 SCREEN 1,1
70 A=USR0(0)
80 SCREEN 0,1
90 INPUT "AGAIN";A$
100 IF A$ = "Y" THEN 60
```

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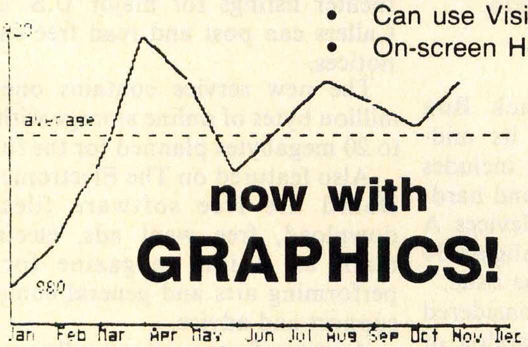

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PIPELINE

INK-A-DINK-A-DO — Computer Friends of Portland, Ore., has introduced the first of its second generation of automatic ribbon re-inkers. The Universal Cartridge Mac Inker and the Universal Spool Mac Inker allow users to use the same inker when they change printers. The new inkers practically eliminate the cost of replacing ribbons.

Operation is simple and wholly automatic, Computer Friends says, and the carbonless ink yields a printout darker than many original ribbons. Re-inked ribbons last longer than the average original ribbon and can be re-inked up to 100 times, depending on their original length.

Mac Inker can ink and re-ink blank cartridges in six different colors: red, blue, green, yellow, brown and purple.

Computer Friends, 6415 SW Canyon Court, Suite 10, Portland, OR 97225.

* * *

NO DISCARD — If you've been looking for a way to encourage clients to hang onto your business cards, CP Products may have just the thing.

If you supply CP Products with your business card, they will embed it in clear plastic and bond it to the back of a wafer-thin, solar-powered, six-function (with memory) calculator. The "business card with a brain" weighs less than an ounce and does not use batteries.

CP Products, Box 431, San Pedro, CA 90733.

* * *

LABELS — Try-O-Byte has just announced a new printer utility called Try-O-Print. It is written in BASIC to permit easy customization of various labels. Try-O-Print is designed for a Color Computer and the printer of your choice.

Available on cassette or diskette, it provides routines to print multiple mailing labels, multiple cassette labels, purchase orders, invoices and a diskette directory in label format, directly from the diskette, using labels of two different sizes.

The memory required for the program is 16K and it runs in either Extended or Non-Extended BASIC. Some customizing is required.

Try-O-Byte, 1009 Alton Circle, Florence, SC 29501.

* * *

READIN', 'RITIN' AND RAM — Computer literacy is being touted as the fourth 'R' in education circles these days. This leaves many parents — unfamiliar with the possibilities of computers as learning tools, but concerned with their children's education — wondering what to do.

The New American Library has just published a book, *Compukids: A Parent's Guide to Computers and Learning*, that is designed to provide parents with all the information they need to know about their child's computer education.

Written by Felicia Antonelli Holton, *Compukids* seeks to explain computers and how they are used: at different age and grade levels; in teaching subjects like art, music, math and grammar; in homework; and in the education of children with handicaps or learning disabilities. The book also tries to help parents assess the quality of computer education their children are receiving.

The New American Library, 1633 Broadway, New York, NY 10019.

* * *

BLACK BOX — The Black Box Corporation recently issued its mid-year catalog of 160 pages. It includes more than 500 basic, unique and hard-to-find data communications devices. A 12-page, full-color insert highlights 36 new products introduced in the issue.

The Black Box Catalog is considered by many people to be *the* catalog of the data communications field. Its publishers claim the catalog offers the largest selection of data switches available anywhere and the broadest line of problem-solving products in the industry.

The Black Box Corporation, P.O. Box 12800, Pittsburgh, PA 15241.

* * *

PERSONAL COMPUTER NET — NewsNet, the nation's largest distributor of specialized business newsletter information, has begun carrying a new publication designed to provide users with the latest information on all aspects of personal computers — hardware, software, systems and peripherals.

The Personal Computer Report, as the new publication is known, covers Tandy, IBM, Apple, AT&T, Compaq, Kaypro, Microsoft, Lotus and Ashton-Tate, among other companies.

The Personal Computer Report is published monthly by Advance Microcomputers, Inc., a computer consulting, sales and publishing company in Mineola, N.Y.

NewsNet, which began in April 1982, offers full text delivery and back issue retrieval of specialized business news ranging from aerospace and investment to taxation and telecommunications.

Marcia Cheetham, NewsNet, 945 Haverford Road, Bryn Mawr, PA 19010.

* * *

ARTS BULLETIN BOARD — Artists and art organizations may be interested in a new computer bulletin board service called the Electronic Call Board, which features entertainment and theater listings for major U.S. cities. Callers can post and read free casting notices.

The new service contains one-half million bytes of online storage with five to 20 megabytes planned for the future.

Also featured on The Electronic Call Board are free software files for download, free want ads, electronic mail, an online magazine for the performing arts and general computer support and advice.

A unique feature allows callers to role play, create characters, write a scene or add to a play in progress.

The Electronic Call Board is seeking artists and organizations without computer access to list their shows, casting notices and want ads.

Bobby Ballard, Atmospheres, 1207 Eighth Ave., Brooklyn, NY 11215.

* * *

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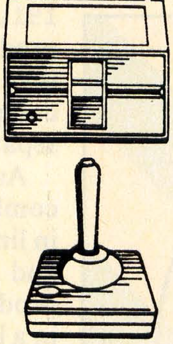

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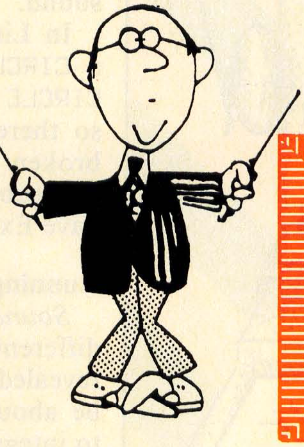

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16K
ECB

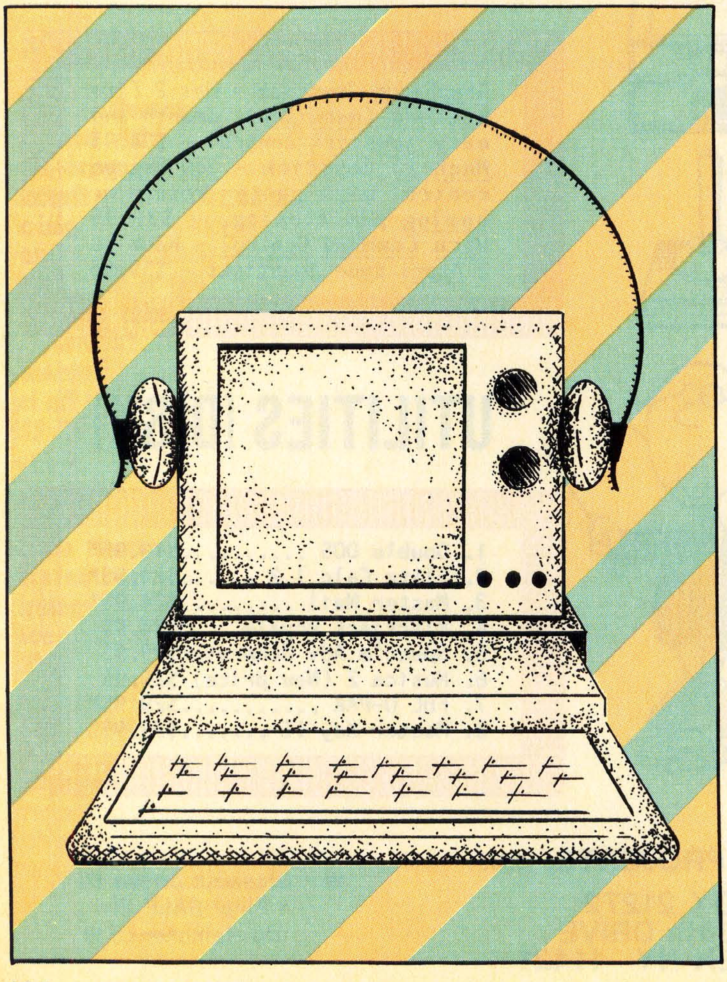
An Adventure Into Sound Experimentation

By Bill Bernico

A demonstration on sound production with the SOUND, PLAY and EXEC commands

One of the things a lot of programs overlook is also one of the things the CoCo is very good at . . . producing sounds. With the help of `SOUND`, `PLAY` and even `EXEC` commands, you can produce some very impressive sounds to help showcase your programs and make them more interesting.

The `SOUND` statement is the simplest. A combination of `SOUND 191,1:SOUND 220,2:SOUND 10,5`, for example, will produce three separate notes. A shorter, easier way is to use the `PLAY` command. With it, simply tell the computer to `PLAY "CFG"` and you will also get three separate notes.



As for `EXEC`, I had to experiment with different combinations to come up with a sound. For example, in lines 530 and 550, I used it to create the "helicopter" and "raspberry" sounds. `EXEC 43345` by itself will produce a short "click" or "blip" sound. Enclose it in a loop, as in Line 550, and you will get the raspberry sound.

In Line 530 you'll probably wonder why there is a `CIRCLE` command when there are no graphics. `CIRCLE` is there only to create a delay between `EXEC`s so there won't be one continuous sound, rather a broken sound such as a helicopter taking off. You can substitute a short `FOR/NEXT` loop if you don't have Extended BASIC.

Running the Program

Sound Story could have simply been a menu with different sounds to pick from, but careful analysis revealed that the attention span of the program would be about 83 seconds. With that in mind, I decided to integrate these sounds into a short (and I do mean short) Adventure.

(Bill Bernico is a self-taught computerist who enjoys programming, golf, TV and music. He has played with a '60s rock band for 18 years.)

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The `REM` statements are highlighted in the listing so that you might examine how each sound is created. I came across a lot of these sounds by accident, by trial and error, and by experimentation. I keep a one-word reminder taped over my CoCo at all times — Experiment!

(Any questions about *Sound Story* may be directed to Mr. Bernico at 708 Michigan Ave., Sheboygan, WI 53081, phone 414-459-7350. If you write, please include an SASE.) ☐

The listing: `SNDSTORY`

```
180 .......42
350 .......52
460 .......96
END .....146
```

```
10 'SOUND STORY
20 'BY BILL BERNICO
30 '708 MICHIGAN AVE.
40 'SHEBOYGAN, WI 53081
50 '(414) 459-7350
60 '
70 '*** TITLE PAGE SOUND ***
80 CLS3:PRINT@43,"SOUND STORY";
90 FORX=1TO255STEP10:SOUNDX,1:NE
XTX
100 FORX=1TO500:NEXTX
110 '*** AUTHOR'S NAME SOUND ***
120 PRINT@201,"BY ";:SOUND220,2:
FORX=1TO150:NEXT:PRINT"BILL ";:S
OUND110,2:FORX=1TO150:NEXT:PRINT
"BERNICO";:SOUND10,2
130 GOSUB560
140 CLS:PRINT"IMAGINE YOURSELF W
ALKING THROUGHTHE WOODS.  YOU CO
ME ACROSS A   HOUSE SET BACK IN
THE TREES.    AS YOU APPROACH, Y
OU SEE THE    DOOR TO THE HOUSE.
150 GOSUB560
160 CLS:PRINT"ON THE DOOR YOU NO
TICE THERE IS A KNOB, A DOORBELL
, A KNOCKER   AND A SMALL PANE O
F GLASS IN THECENTER.  THERE DOE
SN'T APPEAR TOBE ANYBODY HOME.
170 GOSUB560
180 CLS:PRINT@40,"WHAT WILL YOU
DO?                -------------
---
190 PRINT@100,"1.) KNOCK ON THE
DOOR
200 PRINT@132,"2.) RING THE DOOR
```

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```
BELL
210 PRINT@164,"3.) TRY THE DOORK
NOB
220 PRINT@196,"4.) LOOK IN THE W
INDOW
230 PRINT@228,"5.) GO AROUND THE
 BACK
240 PRINT@260,"6.) ESCAPE IN HEL
ICOPTER
250 PRINT@292,"7.) GIVE UP
260 PRINT@360,"CHOOSE (1-7)
270 A$=INKEY$:IFA$=""THEN270
280 A=VAL(A$)
290 IF A<1 OR A>7 THEN 260
300 ON A GOTO 330,370,410,430,46
0,530,550
310 GOTO 310
320 '*** DOOR KNOCK SOUND ***
330 CLS:FORX=1TO3:PLAY"T150O1V31
CDCGABV25CV20CV15DV10DV5EV1E":PR
INT@133,"KNOCK!  KNOCK!  KNOCK!"
:NEXTX
340 PRINT@330,"NOBODY HOME":GOSU
B580:GOTO180
350 GOSUB 580
360 '*** DOORBELL SOUND ***
370 CLS:PRINT@135,"RRRRRRRRRRRRI
NG!!":PLAY"L20V30T50O5GBGBGBGBGB
GBGBGBGBGBGBGBGBGBGBGBGBGBGBGBG
380 PRINT@330,"NOBODY HOME":GOSU
B580:GOTO180
390 GOSUB 580
400 '*** BURGULAR ALARM ***
410 CLS:PRINT@162,"WARNING!  WAR
NING!  WARNING!":PRINT@224,"(FOR
GOT ABOUT THE BURGLAR ALARM)":Q$
="1;2;3;4;5;6;7;8;9;10;11;12;":F
ORX=1TO15:PLAY"O5L242V15;":PLAY
Q$:NEXTX
420 GOSUB580:GOTO180
430 CLS:PRINT@195,"YOU SEE A BIR
D CAGE ON A         STAND.  THERE
'S A SMALL          BIRD IN IT. H
E JUST SAW YOU."
440 '*** BIRD CHIRP SOUND ***
450 FORX=1TO5:PLAY"L255T255V20O5
CGCEC":FORY=1TO200:NEXTY,X:GOSUB
580:GOTO180
460 CLS:PRINT@100,"YOU'RE IN THE
 BACK YARD.        YOU SEE THE O
WNER OF THE        HOUSE WITH A
MACHINE GUN!                BETTER R
UN....
470 GOSUB580
480 '***MACHINE GUN SOUND ***
490 FORF=1TO3
500 FORX=1TO10:PLAY"L190O1V28CV2
9DV20EV10F#V21G#V16GV31":NEXTX:F
ORD=1TO500:NEXTD
510 NEXTF:GOTO180
520 '***HELICOPTER SOUND ***
530 CLS:FORF=449TO42STEP-31:PRIN
T@F,"UP, UP AND AWAY":FORY=1TO3:
CIRCLE(10,10),4:EXEC43345:PRINT@
F,"":NEXTY,F:GOSUB580:GOTO 180
540 '*** RASPBERRY SOUND ***
550 CLS:FORX=1TO100:EXEC43345:NE
XTX:PRINT"MY, WHAT A SHORT ADVEN
TURE":END
560 PRINT@484,"HIT ANY KEY TO CO
NTINUE";:EXEC44539:RETURN
570 GOTO 570
580 FORX=1TO2000:NEXTX:RETURN
```

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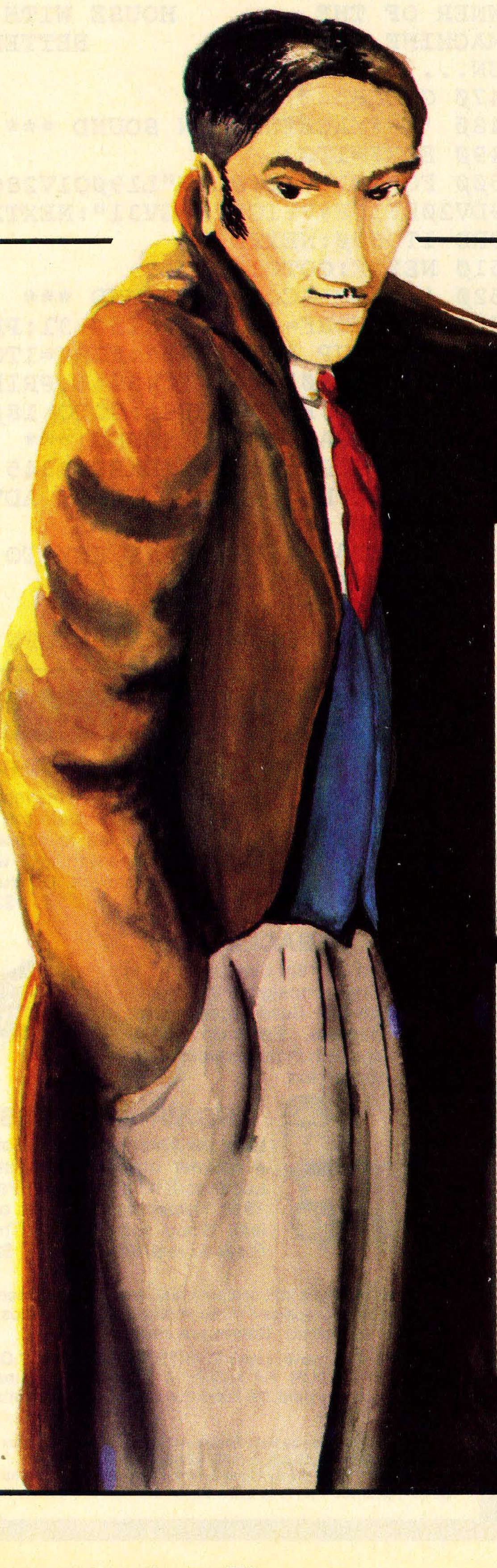
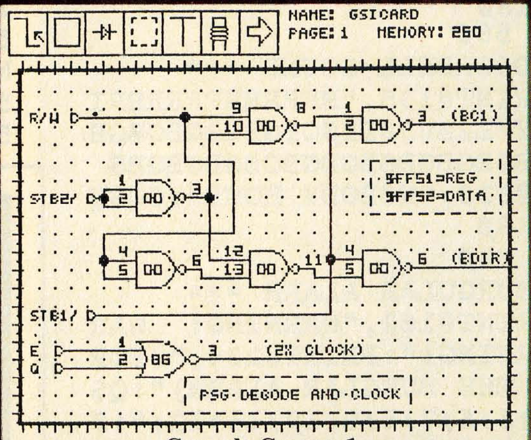
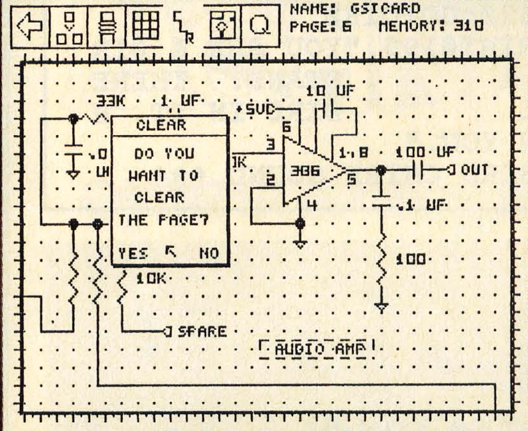




NAME: GSICARD
PAGE: 1 MEMORY: 260

R/W
STB2/
STB1/
E
Q
9
10
8
1
2
3
(BC1)
00
$FF51=REG
$FF52=DATA
4
5
6
12
13
11
(BDIR)
86
(2X CLOCK)
PSG DECODE AND CLOCK

Sample Screen 1



NAME: GSICARD
PAGE: 6 MEMORY: 310

CLEAR
DO YOU WANT TO CLEAR THE PAGE?
YES NO

33K
.1 UF
10 UF
+5VDC
.01
UH
1K
386
1.8
100 UF
OUT
.1 UF
100
10K
SPARE
AUDIO AMP

Sample Screen 2

CoCocad:

The Schematic Scoundrel

Don't let the name fool you, for this schematic drawing aid makes illustrating a breeze . . .

By Peter Kerckhoff

A "mini-cad" (computer-aided design) program for the Color Computer, *CoCocad* aids you in drawing schematics. It requires a 32K Color Computer, one disk drive, a printer with bit mapped graphics ability and a positioning device (Radio Shack color mouse, joystick, X-pad or touch tablet). *CoCocad* is icon menu driven, and the keyboard is seldom used. Some functions make use of a "pop-up" menu for their options.

Instead of digging into the program and describing how I got each function to work, I have provided a highly commented listing (*COCOCAD .REM*); as they say, "leave the proof to the student." A word of caution: The commented listing is rather long and you'll have to `PCLEAR 1` just to load it in. You'll also have to remove all of the remark statements and resave the program (use the name *COCOCAD .BAS*) before you try to run it. If you are keying in the program, just leave the remarks out and don't do the `PCLEAR`.

I've also included a short program listing, *REMOVREM*, to remove the remarks for you. Just remember to reload and resave the new *CoCocad* program as the remark remover program generates an ASCII file (program) that takes awhile to load.

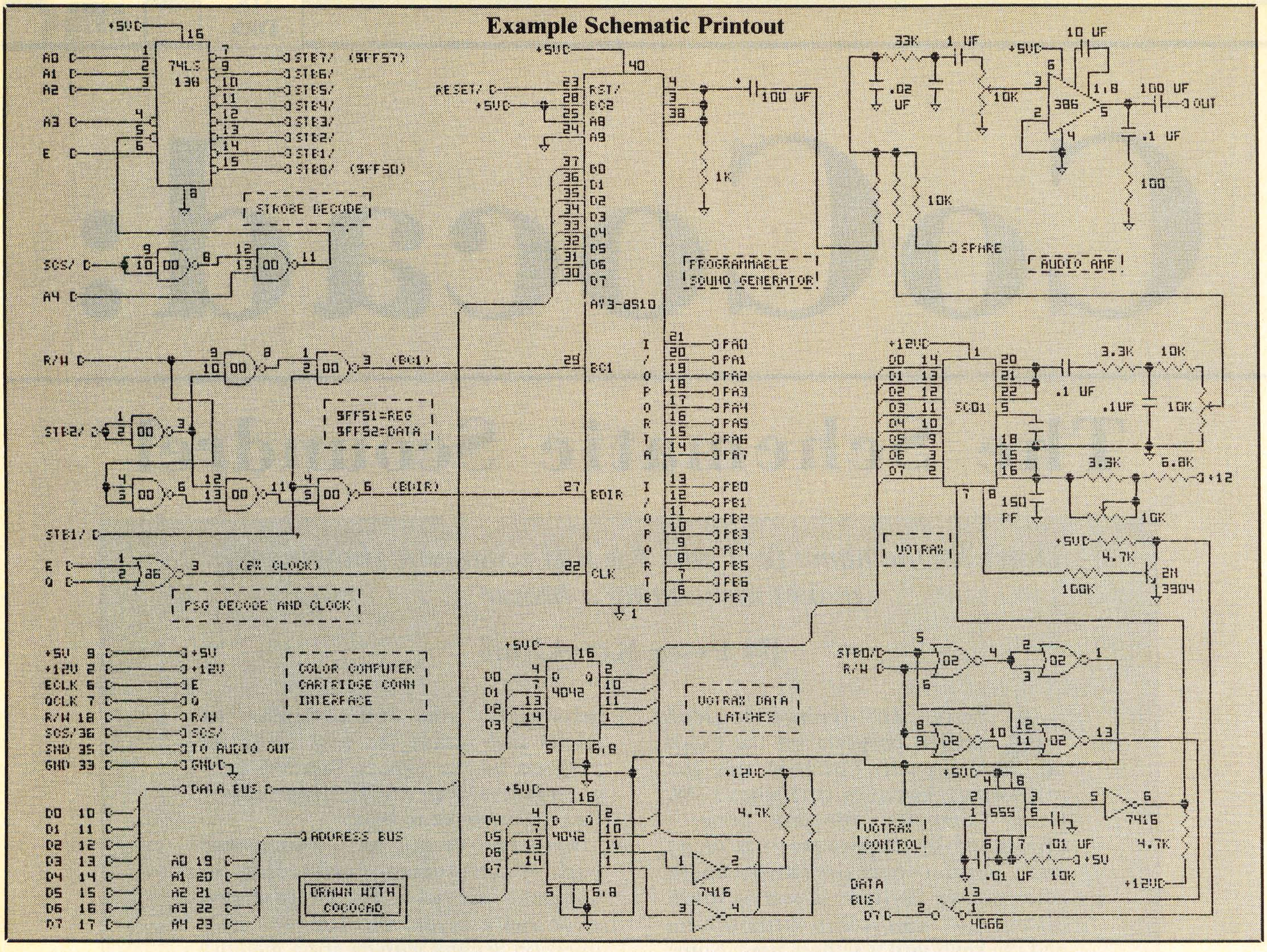
Once you've got an uncommented copy of the program, load it into the computer and run it. The screen should clear and a header line followed by a question dealing with clearing memory should appear at the top of the screen. The memory clear question is so you can restart the program with a schematic in memory without losing the schematic. Since you do not have a schematic in memory, you should answer 'Y'. After a very short delay the screen will again clear and the work sheet screen will appear.

The work sheet screen is where almost all of the action takes place. At the upper left-hand corner of the screen is a series of boxes with small figures (icons) in them. I've provided a couple of screen dumps, Sample Screens 1 and 2, that show the work sheet screens. These boxes are used to call the various functions into use (more about this in a moment). In the upper right-hand portion of the display is a display of the current filename, the current page number and the memory remaining in the page.

A page is a sub-page of the whole schematic. The schematic is made up of nine sub-pages arranged in an array

---

(Peter Kerckhoff has been working with computers since 1975 and has a bachelor's degree in electronics engineering technology. He and his wife, Renee, and daughter, Danielle, live in Silicon Valley.)



Example Schematic Printout

74LS 138
STROBE DECODE
PROGRAMMABLE SOUND GENERATOR
AY3-8910
AUDIO AMP
386
SPARE
$FF51=REG
$FF52=DATA
PSG DECODE AND CLOCK
(2X CLOCK)
(BC1)
(BDIR)
SC01
VOTRAX
2N 3904
COLOR COMPUTER CARTRIDGE CONN INTERFACE
VOTRAX DATA LATCHES
4042
VOTRAX CONTROL
555
7416
4066
DATA BUS
ADDRESS BUS
TO AUDIO OUT
DRAWN WITH COCOCAD

three across and three down. Page zero is the upper left-hand corner of the finished schematic. Page one is just below page zero and page two just below page one. Page eight is the lower right-hand corner.

The memory for a page is used for storing each function you use to draw the schematic. If you start running out of memory space, the computer will warn you by beeping.

The main portion of the screen is taken up by the schematic work area. The sides of the work area have grid marks on them to ease the drawing of lines between pages. The work area itself is stippled with dots every eight pixels. When you are in the schematic work area, your cursor will "snap" to either the dots or to the area halfway between the dots. This makes the positioning of line end points, components and text easier.

Somewhere on the screen there should appear an arrow. The arrow should be under positional control by your mouse (X-pad, joystick, touch pad, etc.). The arrow cursor appears when the computer wants you to select an item from the menu (or submenu, as we'll see in a minute). To select an item, position the arrow on the item and click the mouse button (press down on the button, then release).

Let's select our first menu item. Move the mouse so the arrow is in the menu box which contains the icon that looks like the letter 'Z'. Now click the mouse button. The sides of the box should disappear, letting you know the computer has accepted your command.

To activate the menu item, move the mouse down into the schematic work area. A new cursor will appear in the work area. This cursor should be shaped like a box whose corners have been flipped inwards. This is the end point (or point) cursor. The point cursor is used to identify an end point or a spot in the work area to the computer.

To draw the line, position the point cursor to the spot in the work area where you want one end of the line to be and click the mouse button. The cursor should flicker and be replaced by a new cursor shaped like a box. This cursor identifies the first end point for your line. If you move the mouse you'll see that you still have control over the point cursor. Move the cursor to the second end point and click the mouse button. A couple of things will happen: The cursors will disappear, a line will be drawn and the memory remaining display will be updated. You still have control of the point cursor, so you can draw another line by identifying end points and so on.

To exit the line function (or any other), move the cursor up into the main menu. The point cursor will disappear and be replaced with the menu-selecting arrow cursor. Whenever you have control of the action on the screen with the mouse you can exit by going up into the main menu. This can come in handy, for example, if you've selected the wrong first end point for a line and you'd like to start over.

OK, a quick review: To select a function from the menu, move the arrow cursor to the function and click, then move down into the schematic work area; to exit a function move the cursor back into the main menu. Easy, isn't it?

The next menu selection is the box function. We'll include in our discussion of the box function the fourth menu item (dashed box) and the fifth menu item (erase), as these functions are very similar.

Select the box function and move the mouse so the point cursor is in the schematic work area. Move the cursor to a point where you want one corner of the box to appear and click the mouse button. The cursor will vanish and, if you look closely, there will be a single pixel blinking on and off at the point where the cursor was. Now move the mouse; a box will follow the mouse's movement. When you are satisfied with the box, click the mouse button again and a box will be drawn and page memory updated. You should have the point cursor back again so you'll be all set to draw another box.

The dashed box and erase functions work much in the same way. The differences are that with the dashed box, when the box has been defined, a dashed box will be drawn. With the erase, the area in the box defined will be erased.

The third menu item, the diode, is used to select one of the preprogrammed components from the component library. Get the arrow cursor back and go up and select the component function. A pop-up menu will appear on the screen in the schematic work area. At the top of the menu is the menu title, in this case "components." In the center of the menu is the currently active component. Down at the bottom of the menu on the left are the words "PREV" and "NEXT." Placing the arrow cursor on either of these words and clicking the mouse button will change the active component displayed in the center of the menu. Holding down the mouse button while the arrow cursor is over one of these words will cycle you through the components.

At the right of the menu on the bottom is the word "USE." Clicking the mouse button while the cursor is over this word will clear the menu from the screen and give you the active component to use. The component will be under mouse control and move about in the schematic work area as you move the mouse. When you have placed the component to the desired position, click the mouse button and the component will be drawn onto the screen. If you move the mouse again, you'll notice that you still have control over the component so that another one can be drawn onto the screen. To select another component or another menu item, just move up into the main menu.

> ***"To select a function from the menu, move the arrow cursor to the function and click . . . to exit a function move the cursor back into the main menu. Easy, isn't it?"***

There are two more menu items, the big 'T' and the right pointing arrow. The 'T' function is used to put text on the screen. Get the arrow cursor back and select the text function. When you move the mouse back down into the work area you will notice there is a new cursor, a small horizontal line; this is the text cursor. Move the text cursor where you want the text to appear and click the mouse button. The cursor will move upwards two pixels and no longer be under mouse control. The cursor moves up so that if you are labeling a line or an end point of a line, the text will line up properly.

Enter text by typing on the keyboard. The backspace (left arrow) key has been implemented so if there is a typing error, use it to correct the error. When you finish with the text entry, press the ENTER key and the page memory will be updated with your text. The text cursor will be under mouse control again so you can move the cursor to the next spot and enter more text.

The final menu item is the right pointing arrow. This function will switch the current menu to the second menu. Try out the function by placing the arrow cursor in the box and clicking the mouse button (don't forget to move the mouse downwards to execute the function). The old menu will disappear and be replaced with a new one.

The first item in this new menu is a left pointing arrow and, you guessed it, will get you back to the original menu. The third menu item is another copy of the erase function and is identical to the one on the original menu. The remaining menu items are new.

The second menu item, the one with the three little squares, is the copy function. Select the function and move down into the work area. Move the point cursor to the area near the object you wish to copy and click the mouse button. Move the mouse so the box that is under mouse control surrounds the object you want to copy and click the mouse button again. The box will disappear and if you move the mouse you'll notice that a copy of the item you boxed will move. When the copy click has been positioned, the mouse button and the copy will be left on the screen and you'll get the point cursor back. Note the size of the boxed area will directly affect how fast the image will move — the larger the box the slower the move.

The fourth menu item, the one with the nine little squares, is the page switch function. When you select the function, a blinking cursor will appear as the current page number (upper right-hand portion of the display). Press a key between zero and eight to select the page. Remember, page zero is in the upper left and page eight is in the lower right of the final schematic. When a page number is selected, the current page will be cleared and the selected page displayed.

The fifth menu item, the box with the "CLR" in it, is the clear page function. Selecting the function will produce a pop-up menu asking if you really want to clear the page. Answer by positioning the cursor over your answer and clicking the mouse button.

The sixth menu item, the box with the little floppy disk, is for disk I/O and will display a pop-up menu when the function is selected. You must enter a filename before you can load or save. Once again, select the commands from the pop-up menu by positioning the cursor over the command and clicking the mouse button.

The last menu item, the large 'Q', is used to quit the program with the option of getting a printout of the schematic in memory. If you do decide to get a printout the computer will check to see if there is enough room on the disk for the temporary storage of the sub-page image files and, if there is, will load and run the schematic printout program (*Cadprint*) after saving the image files.

The best and easiest way to get familiar with *CoCocad* is to use the program. You'll find the mouse really does work well with the program and that selecting and using the various functions follow a logical order. Before going in and modifying the program, make sure you look it over. There are quite a few subroutines you may want to use.

For X-pad users, you will have to change the mouse scan routine to read the X-pad. You will also notice the pen status is stored in the variable 'P' and can be read directly from the X-pad (guess what positioning device I started writing the program with!).

In closing, if you use *CoCocad* to draw a schematic you hope to have published, please put a little note somewhere on it denoting *CoCocad* was used to draw the schematic — my ego will get a kick out of it. Any questions you have regarding these programs may be directed to me at 4335 Hendrix Way, San Jose, CA 95124. Please include an SASE. ☐

43	172	436	57	831	213
90	134	460	167	874	89
110	252	494	143	960	81
141	42	530	117	1100	49
170	237	562	206	1280	153
211	225	610	125	1580	254
241	115	641	4	1730	217
280	38	690	17	1780	95
314	240	720	223	1860	50
345	69	747	72	1966	97
400	42	773	200	END	23

Listing 1: COCOCAD

This is a commented listing of the program *CoCocad*. To load the program you must first `PCLEAR 1`. To run the program you must remove all of the comment lines. Don't forget to `PCLEAR 4` before running.

```
0 '
1 '  COCOCAD       VR 2.0
2 '  (C) 1985 BY P.KERCKHOFF
3 '  4335 HENDRIX WAY SAN JOSE CA
4 '
5 '  A cad SYSTEM FOR THE COLOR
6 '  COMPUTER. REQUIRES 32K, DISK
7 '  MOUSE AND A GRAPHICS PRINTER
8 '
9 '
10 CLEAR 500,&H64FF:CLS:INPUT"CO
COCAD VR 2.0   P.KERCKHOFF    CL
EAR PAGE MEMORY (Y/N)";A$:GOTO12
0
11 '
12 '
13 ' READ MOUSE POSITION => X,Y
14 ' BUTTON STATUS =>P (P=3 IF
15 ' BUTTON IS PRESSED)
16 '
20 X=JOYSTK(0)*4:Y=JOYSTK(1)*4:P
=ABS((1 AND PEEK(&HFF00))*3-3):I
F X<3 THEN X=3 ELSE IF X>252 THE
N X=252
30 IF Y<3 THEN Y=3 ELSE IF Y>188
 THEN Y=188
40 RETURN
41 '
42 '
43 ' PUT A CURSOR INTO ARRAY C2
44 ' TO BE USED LATER
45 '
50 GET(0,0)-(6,6),C1,G:LINE(0,0)
-(6,6),PRESET,BF:DRAW"BM3,3XC$(N
);":GET(0,0)-(6,6),C2,G:PUT(0,0)
-(6,6),C1,PSET:RETURN
51 '
52 '
53 ' PUT A CURSOR ON THE SCREEN
54 ' OLD SCREEN DATA => C1
55 '
60 GET(X-3,Y-3)-(X+3,Y+3),C1,G:P
UT(X-3,Y-3)-(X+3,Y+3),C2,AND:RET
URN
61 '
62 '
63 ' REMOVE CURSOR FROM THE
64 ' SCREEN
65 '
70 PUT(X-3,Y-3)-(X+3,Y+3),C1,PSE
T:RETURN
71 '
72 '
73 ' DRAW A CHARACTER ROUTINE
74 ' ENTER WITH THE CHARACTER
75 ' IN A$
76 '
80 IF ASC(A$)>62 THEN 90 ELSE ON
 ASC(A$)-31 GOTO 1120,1130,1140,
1150,1160,1170,1180,1190,1200,12
10,1220,1230,1240,1250,1260,1270
,1280,1290,1300,1310,1320,1330,1
340,1350,1360,1370,1380,1390,140
0,1410,1420
90 ON ASC(A$)-62 GOTO 1430,1440,
1450,1460,1470,1480,1490,1500,15
10,1520,1530,1540,1550,1560,1570
,1580,1590,1600,1610,1620,1630,1
640,1650,1660,1670,1680,1690,170
0
91 '
92 '
93 ' DRAW A STRING OF CHARACTERS
94 ' ENTER WITH CHARACTER STRING
```

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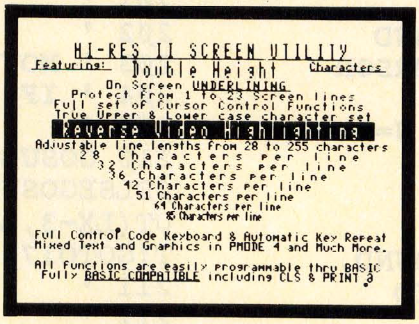

```
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    28  Characters  per  line
     32  Characters  per  line
      36  Characters  per  line
       42  Characters  per  line
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Upper/Lower case characters	Yes	Yes	Yes
Mixed Text and Graphics	Yes	Yes	Yes
Separate Text & Graphics	Yes	Yes	No
Print @ fully implemented	Yes	Yes	Yes
Print @ on all line lengths	Yes	Yes	51 only
Different line lengths	28 to 255 (9)	28 to 255 (9)	51 only (1)
Automatic Key Repeat	Yes	Yes	Yes
Adjustable Key Repeat	Yes	No	No
Auto Repeat Disable	Yes	No	No
Erase to end of line/screen	Yes	Yes	Yes
Home Cursor	Yes	Yes	Yes
Solid or Blinking Cursor	Yes	No	Yes
CLS command supported	Buff/Black	Buff/Black	Buff/Black
X,Y Coordinate Cursor Positioning	Yes	Yes	No
Double Size Characters	Yes	Yes	No
Individual/Continuous Highlighting	Yes	Yes	No
On Screen Underlining	Yes	Yes	No
Clear Key functional	Clear/L keys	Clear key	No
16,32 & 64K Supported	Yes	Yes	Yes
Green or Black Background Color	Yes	No	No
Dual Character sets for Enhanced 64 and 85 Characters per line display	Yes	No	No
Protected Screen Lines (programmable)	1 to 23	No	No
Full Control Code Keyboard for Screen control directly from the keyboard	Yes	No	No
Programmable Tab Character Spacing	Yes	No	No
Full Screen Reverse Function	Yes	Yes	No
Switch to & from the Standard 16 by 32 Screen for full compatability	Yes	No	No
On Error Goto Function	No	No	Yes
Extended Basic Required	No	Yes	Yes
All Machine Language Program	Yes	Yes	Yes
RAM Required in addition to Screen RAM	2K	2K	2K
Program Price (Tape)	$24.95	$19.95	$29.95

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```
95 ' IN T$, SCREEN POSITION IN
96 ' TX AND TY. TX IS UPDATED
97 '
100 FOR C=1 TO LEN(T$):DRAW"BM=T
X;,=TY;":A$=MID$(T$,C,1):GOSUB 8
0:TX=TX+5:NEXT C:RETURN
101 '
102 '
103 ' UPDATE THE SCREEN DISPLAY
104 ' OF MEMORY SPACE REMAINING
105 '
110 LINE(221,9)-(236,13),PRESET,
BF:T$=STR$(768-AD(PG)+A(PG)):T$=
RIGHT$(T$,LEN(T$)-1):TX=221:TY=1
3:GOSUB100:IFLEN(T$)=1THENPLAY"E
EO3EEO2EEO1EEO4EE":RETURN ELSE R
ETURN
111 '
112 '
113 ' START OF THE PROGRAM.
114 '
120 DIM C$(3),A(8),AD(8),C1(1),C
2(1),C3(1),L1(6),L2(6),L3(6),L4(
6),CM(15),CO(15),MD(255),MO(255)
:B$="V31L100O4B":NF$="NONE"
121 '
122 '
123 ' DEFINE CURSOR FONTS AND
124 ' SUBPAGE STORAGE ADDRESSES
125 ' CLEAR FIRST BYTE IN MEMORY
126 ' IF CLEARING MEMORY
127 '
130 C$(0)="BHNL2U2BR2D2R2BD2L2D2
BL2U2L2":C$(1)="BH3ND2R2BR2R2D2B
D2D2L2BL2L2U2":C$(2)="R3":C$(3)=
"NF2H2ND3R3":FOR X=0 TO 8:A(X)=X
*768+&H6500:IF A$="Y" THEN POKEA
(X),0:NEXT ELSE NEXT
131 '
132 '
133 ' SETUP THE SCREEN AND
134 ' CREATE AN ARROW CURSOR
135 '
140 PG=0:GOSUB1710:MN=0:N=3:GOSU
B50
141 '
142 '
143 ' MOVE THE ARROW AROUND,
144 ' WAITING FOR A VALID
145 ' COMMAND.
146 '
150 GOSUB20:GOSUB60:IF P<>3 OR Y
>20 THEN GOSUB 70:GOTO 150 ELSE
GOSUB 70: F=INT(X/20):IF F>6 THE
N 150 ELSE LINE(F*19+1,1)-(F*19+
20,20),PRESET,B:F=F+1:PLAYB$
151 '
152 '
153 ' WAIT FOR BUTTON NOT
154 ' PRESSED AND NOT IN MENU
155 ' AREA THEN GO TO MENU
156 ' SELECTION.
157 '
160 GOSUB 20:IF Y<20 OR P=3 THEN
 160 ELSE IF MN=0 THEN ON F GOTO
 190,290,440,290,520,290,180 ELS
E ON F GOTO180,580,290,680,700,7
40,820
161 '
162 '
163 ' BACK FROM MENU SELECTION,
164 ' REBUILD MENU, LOOP FOR
165 ' NEXT SELECTION.
166 '
170 PLAYB$:F=F-1:LINE(F*19+1,1)-
(F*19+20,20),PSET,B:N=3:GOSUB50:
GOTO150
171 '
172 '
173 ' SWAP MENU
174 '
180 LINE(0,0)-(134,20),PRESET,BF
:FORX=0TO6:LINE(X*19+1,1)-(X*19+
20,20),PSET,B:NEXT:IF MN=1 THEN
MN=0:GOSUB 1760:GOTO170 ELSE MN=
1:GOSUB 1770:GOTO170
181 '
182 '
183 ' LINE FUNCTION, CREATE
184 ' POINT CURSOR
185 '
190 N=0:GOSUB50:LX=-1
191 '
192 '
193 ' WAIT FOR BUTTON NOT
194 ' PRESSED
195 '
200 GOSUB20:IFP=3THEN200
201 '
202 '
203 ' MOVE POINT CURSOR, EXIT
204 ' IF IN MENU AREA
205 '
210 GOSUB20:GOSUB60:IFY>20THEN22
0ELSEGOSUB70:IFLX=-1THEN170ELSEP
UT(LX-3,LY-3)-(LX+3,LY+3),C3,PSE
T:GOTO170
211 '
212 '
213 ' CONTINUE MOVING THE CURSOR
214 ' UNTIL BUTTON IS PRESSED
215 '
220 GOSUB70:IFP<>3THENX1=X:Y1=Y:
GOTO210ELSEPLAYB$:X=X1:Y=Y1
221 '
222 '
223 ' IF NO PREV POINT SET THEN
224 ' SET FIRST POINT, DRAW A
```

```
225 ' CURSOR THERE AND LOOP BACK
226 ' FOR SECOND END POINT
227 '
230 IF LX=-1 THEN LX=X:LY=Y:GET(
LX-3,LY-3)-(LX+3,LY+3),C3,G:DRAW
"BM=LX;,=LY;XC$(1);":GOTO200
231 '
232 '
233 ' REMOVE FIRST END POINT
234 ' CURSOR, EXIT IF IN MENU
235 ' AREA
236 '
240 PUT(LX-3,LY-3)-(LX+3,LY+3),C
3,PSET:IF Y<27 THEN 170
241 '
242 '
243 ' SNAP COORDINATES
244 '
250 X=INT(X/4)*4:Y=INT(Y/4)*4
251 '
252 '
253 ' DRAW THE LINE, UPDATE SUB
254 ' PAGE MEMORY, LOOP BACK FOR
255 ' THE NEXT LINE.
256 '
260 LINE(X,Y)-(LX,LY),PSET:POKEA
D(PG),52:POKEAD(PG)+1,X:POKEAD(P
G)+2,Y:POKEAD(PG)+3,LX:POKEAD(PG
)+4,LY:AD(PG)=AD(PG)+5:POKEAD(PG
),0:GOSUB110:LX=-1:GOTO200
261 '
262 '
263 ' ROUTINE TO SAVE THE SCREEN
264 ' DATA WHERE A BOX IS DRAWN
265 ' AND TO DRAW THE BOX.
266 '
270 GET(PX,PY)-(LX,PY),L1,G:GET(
PX,PY)-(PX,LY),L2,G:GET(LX,LY)-(
PX,LY),L3,G:GET(LX,LY)-(LX,PY),L
4,G:LINE(PX,PY)-(LX,LY),PSET,B:R
ETURN
271 '
272 '
273 ' ROUTINE TO UNDRAW THE BOX
274 ' BY PUTTING THE ORIGIONAL
275 ' DATA BACK
276 '
280 PUT(PX,PY)-(LX,PY),L1,PSET:P
UT(PX,PY)-(PX,LY),L2,PSET:PUT(LX
,LY)-(PX,LY),L3,PSET:PUT(LX,LY)-
(LX,PY),L4,PSET:RETURN
281 '
282 '
283 ' BOX ROUTINE, SET UP FOR
284 ' POINT CURSOR
285 '
290 N=0:GOSUB50
291 '
292 '
293 ' MOVE THE CURSOR, EXIT IF
294 ' IN MENU AREA, WAIT FOR
295 ' BUTTON PRESSED.
296 '
300 GOSUB20:GOSUB60:IF Y<20 THEN
 GOSUB70:GOTO170 ELSE IF P<>3 TH
EN GOSUB70:GOTO300
301 '
302 '
303 ' REMOVE THE POINT CURSOR,
304 ' SET UP BOX COORDINATES
305 '
310 GOSUB70:LX=X:LY=Y:PX=LX:PY=L
Y
311 '
312 '
313 ' WAIT FOR BUTTON NOT
314 ' PRESSED
315 '
320 GOSUB20:IFP=3THEN320
321 '
322 '
323 ' DRAW A BOX, SCAN MOUSE,
324 ' EXIT IF IN MENU AREA,
325 ' LOOP IF BUTTON NOT PRESSED
326 ' (WHEW!)
327 '
330 GOSUB270:GOSUB 20:IF Y<20 TH
```

Connect your TRS-80 Color Computer to the Outside World

Learn the simple techniques for putting your computer to work monitoring and controlling outside devices and instruments. Construct and use input and output ports, analog-to-digital and digital-to-analog converters to control signals using BASIC language programs. Excellent for individual or classroom instruction.

The book, **TRS-80 Color Computer Interfacing, With Experiments**, no. 21893, fully explains the fundamentals and illustrates them with experiments. $14.95

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```
EN GOSUB 280:GOTO 170 ELSE IF P<
>3 THEN GOSUB 280:PX=X:PY=Y:GOTO
 330
331 '
332 '
333 ' UPDATE MEMORY AS TO BOX
334 ' COORDINATES, IF FUNCTION
335 ' WAS A BOX THEN UPDATE MEM
336 ' WITH BOX COMMAND AND LOOP
337 ' BACK FOR THE NEXT BOX.
338 '
340 POKEAD(PG)+1,LX:POKEAD(PG)+2
,LY:POKEAD(PG)+3,PX:POKEAD(PG)+4
,PY:POKEAD(PG)+5,0:IF F=2 THEN P
OKE AD(PG),53:AD(PG)=AD(PG)+5:GO
SUB110:GOTO290
341 '
342 '
343 ' IF DASHED BOX THEN ERASE
344 ' THE OLD (CURSOR) BOX,
345 ' UPDATE MEMORY FOR THE
346 ' DASHED BOX COMMAND.
347 '
350 IF F<>4 THEN 410 ELSE LINE(L
X,LY)-(PX,PY),PRESET,B:POKEAD(PG
),55:
351 '
352 '
353 ' MAKE SURE THE COORDINATES
354 ' WILL WORK IN THE FOR/NEXT
355 ' LOOP
356 '
360 X=PX:Y=PY:IF X>LX THEN PX=LX
:LX=X:X=PX
370 IF Y>LY THEN PY=LY:LY=Y:Y=PY
371 '
372 '
373 ' DRAW THE DASHED BOX
374 '
380 AD(PG)=AD(PG)+5:GOSUB110:FOR
 X1=X TO LX STEP 8:Y1=X1+4:IF Y1
>LX THEN Y1=LX
390 LINE(X1,Y)-(Y1,Y),PSET:LINE(
X1,LY)-(Y1,LY),PSET:NEXT:FOR X1=
Y TO LY STEP8:Y1=X1+4:IF Y1>LY T
HEN Y1=LY
391 '
392 '
393 ' WHEN ALL DONE, LOOP BACK
394 ' FOR THE NEXT DASHED BOX
395 '
400 LINE(X,X1)-(X,Y1),PSET:LINE(
LX,X1)-(LX,Y1),PSET:NEXT:GOTO290
401 '
402 '
403 ' MUST BE THE CLEAR AREA
404 ' FUNCTION SO CLEAR THE
405 ' AREA.
406 '
```

```
410 LINE(LX,LY)-(PX,PY),PRESET,B
F:IF PX>LX THEN X=PX:PX=LX:LX=X
420 IF PY>LY THEN Y=PY:PY=LY:LY=
Y
421 '
422 '
423 ' REBUILD THE STIPPLED
424 ' BACKGROUND DESTROYED IN
425 ' THE CLEAR AND THEN LOOP
426 ' BACK FOR THE NEXT CLEAR.
427 '
430 PX=INT(PX/8)*8:PY=INT(PY/8)*
8+4:FOR X=PX TO LX STEP 8:FOR Y=
PY TO LY STEP 8:PSET(X,Y):NEXT Y
,X:POKEAD(PG),54:AD(PG)=AD(PG)+5
:GOSUB110:GOTO290
431 '
432 '
433 ' COMPONENTS FUNCTION,
434 ' BUILD POP-UP MENU, GET
435 ' ARROW CURSOR
436'
440 T$="COMPONENTS":GOSUB850:T$=
"NEXT   USE":TX=55:TY=115:GOSUB1
00:T$="PREV":TX=55:TY=107:GOSUB1
00:N=3:GOSUB50:N=1:DRAW"BM65,65"
:GOSUB870
441 '
442 '
443 ' SCAN THE MOUSE, IF IN THE
444 ' MENU AREA THEN EXIT ELSE
445 ' LOOP UNTIL BUTTON IS
446 ' PRESSED ON A VALID COMMAND
447 '
450 GOSUB20:GOSUB60:GOSUB70:IF Y
<27 THEN PLAYB$:PUT(50,50)-(110,
120),MO,PSET:GOTO170 ELSE IF Y<1
00 OR Y>118 OR X<55 OR X>110 OR
P<>3 THEN 450 ELSE PLAY B$
451 '
452 '
453 ' IF 'USE' THEN GET THE
454 ' COMPONENT AND BRANCH ELSE
455' ERASE THE COMPONENT AND
456' EITHER DRAW THE NEXT ONE
457 ' AND LOOP
458 '
460 IF X>80 THEN GET(65,65)-(65+
XW,65+YW),CM,G:PUT(50,50)-(110,1
20),MO,PSET:GOTO480 ELSE DRAW"BM
65,65C5":GOSUB870:DRAW"BM65,65C0
":IF Y<109 THEN 470 ELSE N=N+1:I
F N<25 THEN GOSUB870:GOTO450 ELS
E N=1:GOSUB870:GOTO450
461 '
462 '
463 ' OR DRAW THE PREVIOUS
464 ' ONE AND LOOP
465 '
```

PIZZA
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BUT... CHECKERBOARDS ARE FOR TABLECLOTHS!

THE LOWERKIT III FROM GREEN MOUNTAIN MICRO

Still cloaking your Color Computer in a checkerboard tablecloth? Since 1981, thousands of Color Computer users have uncovered their computer by discovering the Lowerkit — the first and best full-time lowercase and special symbols generation system for your Color Computer.

Why a Lowerkit? Because uppercase-only display is a relic of the user-unfriendly past. And because you can't really read a checkerboard excuse for lowercase display. Sure, software lowercase comes with a handful of commercial programs. But software lowercase gobbles up over 6,000 bytes of your precious memory. Even if you have 64K, you'll give up 10% of it for a simple lowercase display. And software lowercase vanishes when you change programs or turn off your computer.

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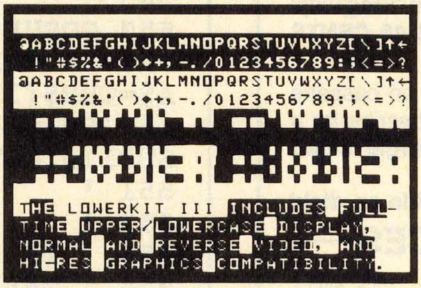
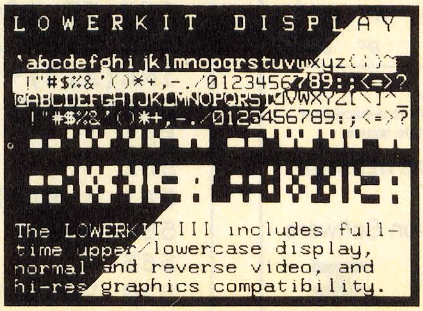
And now, the new Lowerkit III includes a reverse screen switch as well. Big, bright green letters on a black background.



```
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]↑←
 !"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]↑←
 !"#$%&'()*+,-./0123456789:;<=>?

THE LOWERKIT III INCLUDES FULL-
TIME UPPER/LOWERCASE DISPLAY,
NORMAL AND REVERSE VIDEO, AND
HI-RES GRAPHICS COMPATIBILITY.
```

Original Color Computer Display



```
LOWERKIT DISPLAY

`abcdefghijklmnopqrstuvwxyz{|}~
 !"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_
 !"#$%&'()*+,-./0123456789:;<=>?

The LOWERKIT III includes full-
time upper/lowercase display,
normal and reverse video, and
hi-res graphics compatibility.
```

LOWERKIT III Display (reverse video, too)

Four years ago, the Lowerkit made history and set the standard in Color Computer lowercase. For example, game and education programs from Sugar Software have Lowerkit display options. Spectrosystems' ADOS supports the Lowerkit; so does Cer-Comp's TextPro. Cartridge Scripsit looks beautiful with a Lowerkit. Spectrum Projects, Cheshire Cat and many others have developed beautiful alternate character sets which you can download from Micronet, burn into an EPROM, and snap into your Lowerkit.

Pull the checkerboard tablecloth off your Color Computer with a **Lowerkit.** The original. The standard.

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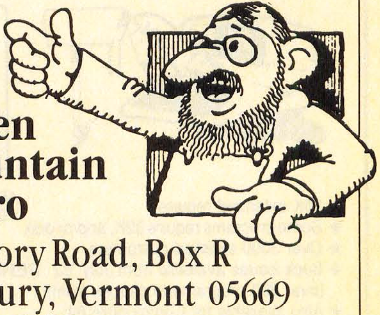

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```
470 N=N-1:IF N>0 THEN GOSUB870:G
OTO450 ELSE N=24:GOSUB870:GOTO45
0
471 '
472 '
473 ' SCAN THE MOUSE
474 '
480 GOSUB20
481 '
482 '
483 ' MOVE THE COMPONENT UNTIL
484 ' BUTTON IS PRESSED OR
485 ' IN MENU AREA
486 '
490 GET(X,Y)-(X+XW,Y+YW),CO,G:PU
T(X,Y)-(X+XW,Y+YW),CM,AND:LX=X:L
Y=Y:GOSUB20:IF P<>3 AND Y>26 THE
N PUT(LX,LY)-(LX+XW,LY+YW),CO,PS
ET: GOTO 490
491 '
492 '
493 ' IF IN MENU AREA THEN ERASE
494 ' THE COMPONENT AND EXIT
495 '
500 IF Y<27 THEN PUT(LX,LY)-(LX+
XW,LY+YW),CO,PSET:GOTO 170
501 '
502 '
503 ' LEAVE THE COMPONENT ON
504 ' THE SCREEN AND UPDATE
505 ' MEMORY. THEN LOOP BACK
506 ' TO PUT THE NEXT COMPONENT
507 ' ON THE SCREEN.
508 '
510 PLAYB$:POKEAD(PG),N:POKEAD(P
G)+1,LX:POKEAD(PG)+2,LY:AD(PG)=A
D(PG)+3:POKEAD(PG),0:GOSUB110:GO
TO480
511 '
512 '
513 ' TEXT FUNCTION
514 ' GO CREATE THE TEXT CURSOR
515 '
520 N=2:GOSUB50
521 '
522 '
523 ' MOVE THE CURSOR, WAITING
524 ' FOR EITHER BUTTON CLICK
525 ' OR IN MENU AREA
526 '
530 GOSUB20:GOSUB60:GOSUB70:IF P
<>3 AND Y>26 THEN 530 ELSE Y=Y-2
531 '
532 '
533 ' IF IN MENU AREA THEN EXIT
535 ' ELSE UPDATE MEMORY FOR
536 ' THE TEXT FUNCTION
537 '
540 IFY<27 THEN 170 ELSE PLAYB$:
POKEAD(PG),51:POKEAD(PG)+1,X:POK
EAD(PG)+2,Y:AD(PG)=AD(PG)+3:GOSU
B110:X1=AD(PG)
541 '
542 '
543 ' GO SCAN THE KEYBOARD, IF
544 ' ENTER IS PRESSED THEN EXIT
545 '
550 GOSUB60:A$=INKEY$:GOSUB70:IF
 A$="" THEN 550 ELSE PLAY B$:IF
A$=CHR$(13) THEN POKE AD(PG),255
:AD(PG)=AD(PG)+1:POKEAD(PG),0:GO
SUB110:GOTO520
551 '
552 '
553 ' IF BACK SPACE IS PRESSED
554 ' THEN DO A BACK SPACE
555 '
560 IF A$=CHR$(8) THEN IF AD(PG)
>X1 THEN AD(PG)=AD(PG)-1:X=X-5:L
INE(X,Y)-(X+5,Y-6),PRESET,BF:GOT
O550 ELSE GOTO550
561 '
562 '
563 ' ELSE DRAW THE CHARACTER
564 ' AND LOOP FOR MORE
565 '
570 POKEAD(PG),ASC(A$):AD(PG)=AD
```

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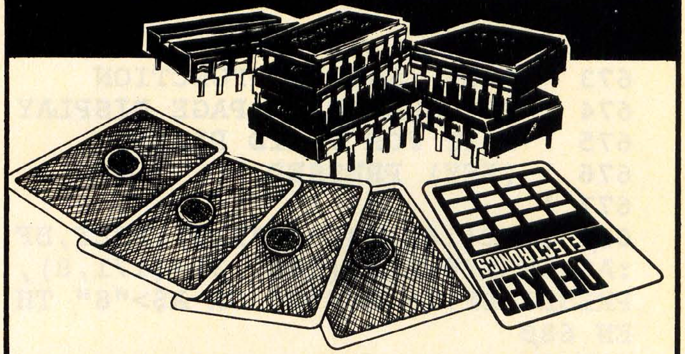
```
(PG)+1:DRAW"BM=X;,=Y;":GOSUB80:X
=X+5:GOSUB110:GOTO550
571 '
572 '
573 ' COPY ROUTINE, GO GET
574 ' A CURSOR
575 '
580 N=0:GOSUB50
581 '
582 '
583 ' MOVE CURSOR UNTIL IN MENU
584 ' AREA OR BUTTON CLICK
585 '
590 GOSUB20:GOSUB60:IF P<>3 AND
Y>26 THENGOSUB70:GOTO590ELSEGOSU
B70:IF Y<27 THEN170
591 '
592 '
593 ' SAVE CURSOR COORDINATES
594 '
600 PLAYB$:LX=X:LY=Y:PX=LX:PY=LY
601 '
602 '
603 ' WAIT FOR BUTTON NOT DOWN
604 '
610 GOSUB20:IFP=3THEN610
611 '
612 '
613 ' DRAW A BOX, SCAN MOUSE IF
614 ' IN MENU THEN ERASE BOX AND
615 ' EXIT, IF BUTTON NOT CLICK
616 ' THEN ERASE BOX AND LOOP
617 '
620 GOSUB270:GOSUB20:IFY<26THENG
OSUB280:GOTO170ELSEIFP<>3THENGOS
UB280:PX=X:PY=Y:GOTO620
621 '
622 '
623 ' ERASE BOX, GET BOXED AREA
624 ' UPDATE MEMORY
625 '
630 GOSUB280:PLAYB$:XW=ABS(PX-LX
):YW=ABS(PY-LY):IF (XW*YW)>10000
 THEN 580 ELSE GET(LX,LY)-(PX,PY
),MD,G:POKEAD(PG)+1,PX:POKEAD(PG
)+2,PY:POKEAD(PG)+3,LX:POKEAD(PG
)+4,LY
631 '
632 '
633 ' SCAN MOUSE, PUT IMAGE ONTO
634 ' THE SCREEN, LOOP UNTILL
635 ' IN MENU OR BUTTON CLICK
636 '
640 GOSUB20:GET(X,Y)-(X+XW,Y+YW)
,MO,G:PUT(X,Y)-(X+XW,Y+YW),MD,AN
D:PUT(X,Y)-(X+XW,Y+YW),MO,PSET:I
FY<27THEN170ELSEIFP<>3THENX1=X:Y
1=Y:GOTO640ELSEX=X1:Y=Y1:PUT(X,Y
)-(X+XW,Y+YW),MD,AND
```

It's time we put our chips on the table



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```
641 '
642 '
643 ' UPDATE MEMORY, LOOP
644 '
650 POKEAD(PG),56:POKEAD(PG)+5,X
:POKEAD(PG)+6,Y:AD(PG)=AD(PG)+7:
POKEAD(PG),0:GOSUB110:GOTO580
671 '
672 '
673 ' PAGE (SWITCH) FUNCTION
674 ' PUT CURSOR AT PAGE DISPLAY
675 ' WAIT FOR VALID PAGE #
676 ' (KEY) PRESSED
677 '
680 LINE(166,13)-(171,8),PSET,BF
:A$=INKEY$:LINE(166,13)-(171,8),
PRESET,BF:IF A$<"0" OR A$>"8" TH
EN 680
681 '
682 '
683 ' DISPLAY NEW PAGE
684 '
690 PG=VAL(A$):DRAW"BM166,13":GO
SUB80:LINE(8,28)-(247,183),PRESE
T,BF:GOSUB1790:FORX=8TO248STEP8:
FORY=28TO184STEP8:PSET(X,Y):NEXT
Y,X:GOSUB110:GOTO170
691 '
692 '
693 ' CLEAR (THE PAGE) FUNCTION
694 ' DISPLAY CLEAR MENU
695 '
700 T$="  CLEAR":GOSUB850:T$="YE
S     NO":TX=55:TY=115:GOSUB100:
N=3:GOSUB50:TX=63:TY=70:T$="DO Y
OU":GOSUB100:TX=60:TY=80:T$="WAN
T TO":GOSUB100:TX=63:TY=90:T$="C
LEAR":GOSUB100:TX=55:TY=100:T$="
THE PAGE?":GOSUB100
701 '
702 '
703 ' SCAN MOUSE, MOVE ARROW
704 ' CURSOR, WAIT FOR VALID
705 ' OPTION CLICK OR IN MAIN
706 ' MENU AREA
707 '
710 GOSUB20:GOSUB60:GOSUB70:IFY<
27 THEN PLAYB$:PUT(50,50)-(110,1
20),MO,PSET:GOTO170 ELSE IF Y<10
0 OR Y>120 OR X<55 OR X>110 OR P
<>3 THEN 710 ELSE PLAY B$
711 '
712 '
713 ' NOPE, DIDN'T REALLY WANT
714 ' TO CLEAR THE PAGE
715 '
720 IF X>80 THEN PUT(50,50)-(110
,120),MO,PSET:GOTO170
```

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```
721 '
722 '
723 '  CLEAR THE PAGE BY SETTING
724 '  FIRST MEMORY BYTE TO 0
725 '  THEN CLEAR THE SCREEN
726 '  AND LOOP BACK TO MAIN
727 '
730 POKEA(PG),0:AD(PG)=A(PG):GOS
UB110:LINE(8,28)-(247,183),PRESE
T,BF:FORX=8TO248STEP8:FORY=28TO1
84STEP8:PSET(X,Y):NEXTY,X:GOTO17
0
731 '
732 '
733 '  DISK FUNCTION(S)
734 '  DISPLAY DISK MENU
735 '
740 T$="   DISK":GOSUB850:T$="NA
ME":TX=70:TY=70:GOSUB100:T$="LOA
D":TX=70:TY=80:GOSUB100:T$="SAVE
":TX=70:TY=90:GOSUB100:N=3:GOSUB
50
741 '
742 '
743 '  SCAN MOUSE, EXIT IF IN
744 '  MAIN MENU AREA, LOOP IF
745 '  BUTTON NOT DOWN OR NOT
746 '  IN DISK MENU
747 '
750 GOSUB20:GOSUB60:GOSUB70:IF Y
<27 THEN PLAYB$:PUT(50,50)-(110,
120),MO,PSET:GOTO170 ELSE IF Y<6
0 OR Y>90 OR X<70 OR X>90 OR P<>
3 THEN 750 ELSE PLAY B$
751 '
752 '
753 '  IF NAME OPTION THEN GET
754 '  A FILE NAME
755 '
760 IF Y>70 THEN 770 ELSE CLS:LI
NEINPUT"FILE NAME =>";NF$:SCREEN
1,1:LINE(170,5)-(210,0),PRESET,B
F:TY=5:TX=170:T$=NF$:GOSUB100:GO
TO750
761 '
762 '
763 '  IF LOAD OR SAVE THEN FIRST
764 '  CHECK FOR A FILE NAME
765 '  IF LOADING THEN LOAD
766 '  THE PAGES (MEMORY) AND
767 '  EXIT
768 '
770 IF NF$="" OR NF$="NONE" THEN
 750 ELSE IF Y>80 THEN 780 ELSE
TX=60:TY=110:T$="LOADING":GOSUB1
00:LOADM NF$:A$="0":GOTO 690
771 '
772 '
773 '  SAVE THE PAGES (MEMORY)
```

```
774 '
780 IF Y>90 THEN 750 ELSE TX=60:
TY=110:T$="SAVING":GOSUB100:SAVE
M NF$,&H6500,&H7FFF,&H6500:LINE(
60,110)-(90,105),PRESET,BF:GOTO7
50
811 '
812 '
813 '  QUIT FUNCTION
814 '  DISPLAY QUIT MENU
815 '
820 T$="    QUIT":GOSUB850:TX=60:
TY=70:T$="SAVE TO":GOSUB100:TX=7
0:TY=80:T$="DISK":GOSUB100:T$="Y
ES    NO":TX=55:TY=115:GOSUB100
:N=3:GOSUB50
821 '
822 '
823 '  THE OL' LOOP UNLESS THE
824 '  OPTION IS CALLED LINE
825 '
830 GOSUB20:GOSUB60:GOSUB70:IF Y
<27 THEN PLAYB$:PUT(50,50)-(110,
120),MO,PSET:GOTO170 ELSE IF Y<1
00 OR Y>120 OR X<50 OR X>110 OR
P<>3 THEN 830 ELSE PLAY B$
831 '
832 '
833 ' BRANCH IF DISK SAVE NEEDED
```

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```
834 ' ELSE CHECK TO SEE IF A
835 ' PRINTOUT IS WANTED ELSE
836 ' EXIT (STOP) THE PROGRAM
837 '
840 IF X<80 THEN PUT(50,50)-(110
,120),MO,PSET:GOTO740 ELSE CLS:I
NPUT"DO YOU WANT A PRINTOUT (Y/N
)";A$:IF A$="Y" THEN 1970 ELSE P
RINT "OK...BYE.":STOP
841 '
842 '
843 ' DISPLAY A (POP-UP) MENU
844 '
850 GET(50,50)-(110,120),MO,G:LI
NE(50,50)-(110,120),PRESET,BF:LI
NE(51,51)-(108,118),PSET,B:LINE(
52,119)-(109,119),PSET:LINE-(109
,52),PSET:LINE(51,60)-(108,60),P
SET:TX=54:TY=57:GOSUB100:RETURN
861 '
862 '
863 ' DRAW A COMPONENT (N)
864 '
870 ON N GOTO 880,890,900,910,92
0,930,940,950,960,970,980,990,10
00,1010,1020,1030,1040,1050,1060
,1070,1080,1090,1100,1110
871 '
```

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```
872 '
873 ' DRAW (STRINGS) FOR THE
874 ' COMPONENTS (IDENTIFIED
875 ' AT THE END OF THE LINES)
876 '
880 DRAW"BD15U15R13FRF4DFD2GDG4L
GL13":XW=23:YW=18:RETURN:'AND
890 DRAW"BD15U15R12FRF4DFD RE2RF
2G2LH2L DGDG4LGL12":XW=28:YW=18:
RETURN:'NAND
900 DRAW"BD16RE2UEU2EU2 HU2HUH2L
R13FR2FRF2RF4 G4LG2LGL2GL12":XW=
25:YW=16:RETURN:'OR
910 DRAW"BD16RE2UEU2EU2HU2HUH2LR
13FR2FRF2RF4 E2R2F2G2L2H2 G4LG2L
GL2GL13":XW=31:YW=17:RETURN:'NOR
920 DRAW"BD16U16FRFRFRFRFRFRFRFG
LGLGLGLGLGLGLG":XW=15:YW=17:RETU
RN:'BUFFER
930 DRAW"BD15U15FRFRFRFRFRFRFRF
RER2FDGL2HU GLGLGLGLGLGLGLGL":XW
=20:YW=17:RETURN:'INVTR
940 DRAW"BD17RE2UEU2EU3HU2HUH2LB
R4R8FR2FRF2RF4DG4LG2LGL2GL7RE2UE
U2EU3HU2HUH2L":XW=24:YW=17:RETUR
N:'XOR
950 DRAW"BD16BR2RE2UEU2EU2HU2HUH
2LBR4R8FR2FRF2RF4 RE2RF2G2LH2L G
4LG2LGL2GL8RE2UEU2EU2HU2HUH2L":X
W=32:YW=17:RETURN:'XNOR
960 DRAW"BD21U19FRFRFRFRFRFRFRFR
FRFGLGLGLGLGLGLGLGLGLGU6 BR3R2LD
U2 BU7LR2":XW=19:YW=22:RETURN:'O
PAMP
970 DRAW"BD8R6NU5ND5E6U2D2G6F5U2
G2R2FD2":XW=12:YW=16:RETURN:'NPN
980 DRAW"BD8R6NU5ND5E6U2D2G2U2F2
L2G4F6D2":XW=12:YW=16:RETURN:'PN
P
990 DRAW"BD4R4E2F4E4F4E4F4E2R4":
XW=32:YW=8:RETURN:'H-REST
1000 DRAW"BR4D4F2G4F4G4F4G4F2D4"
:XW=8:YW=32:RETURN:'V-REST
1010 DRAW"BD4R4NU4ND4BR4NU4ND4R4
":XW=12:YW=8:RETURN:'H-CAP
1020 DRAW"BR4D4NL4NR4BD4NL4NR4D4
":XW=8:YW=12:RETURN:'V-CAP
1030 DRAW "BD4BR8 L4H2L2R2F2G2L2
U4":XW=7:YW=10:RETURN:'INPUT
1040 DRAW"BD4R4E2R2D4L2H2":XW=10
:YW=6:RETURN:'OUTPUT
1050 DRAW"BD3ER2FD2GL2HU2":XW=8:
YW=8:RETURN:'NOT DOT
1060 DRAW "BD3BR2END2RND2RND2FDN
L2DNL2GLNU2LNU2HUR2UR2":XW=8:YW=
8:RETURN:'CON DOT
1070 DRAW"BR4D4L3F3E3L3":XW=8:YW
=8:RETURN:'GND
1080 DRAW"BD4R5ND4U4F4NG4RNU4ND4
```

```
R5":XW=15:YW=8:RETURN:'>DIODE
1090 DRAW"BD4R5ND4NU4RNF4E4D4ND4
R5":XW=15:YW=8:RETURN:'<DIODE
1100 DRAW"BD8R2E2F4E4U6D5NH2NE2D
F4E4F4E2R2":XW=28:YW=10:RETURN:'
H-POT
1110 DRAW"BR4D2F2G4F4R6L5NE2NF2L
G4F4G4F2D2":XW=14:YW=28:RETURN:'
V-POT
1111 '
1112 '
1113 ' DRAW (STRINGS) FOR THE
1114 ' TEXT CHARACTERS
1115 '
1120 DRAW"BR4":RETURN
1130 DRAW"RBU2U2LD2":RETURN
1140 DRAW"BU2U2BR2D2":RETURN
1150 DRAW"BRU4BR2D4URL4RU2LR4":R
ETURN
1160 DRAW"R3U2L3U2R3LD4":RETURN
1170 DRAW"E4BL3DBR3BD2D":RETURN
1180 DRAW"BR2NU4H2R3":RETURN
1190 DRAW"BRBU4D2":RETURN
1200 DRAW"BR2HU2E":RETURN
1210 DRAW"BREU2H":RETURN
1220 DRAW"BUE2GHF2":RETURN
1230 DRAW"BU2R2LUD2":RETURN
1240 DRAW"BRU2":RETURN
1250 DRAW"BU2R3":RETURN
1260 DRAW"BRURD":RETURN
1270 DRAW"UE2U":RETURN
1280 DRAW"U4R3D4L3":RETURN
1290 DRAW"R2LU4G":RETURN
1300 DRAW"NR3U2R3U2L3":RETURN
1310 DRAW"R3U2NL2U2L3":RETURN
1320 DRAW"BU4D2R3U2D4":RETURN
1330 DRAW"R3U2L3U2R3":RETURN
1340 DRAW"NU2R3U2L3U2R3":RETURN
1350 DRAW"BU4R3DGD2":RETURN
1360 DRAW"NU4R3U2NL3U2L3":RETURN
1370 DRAW"R3U2L3U2R3D2":RETURN
1380 DRAW"RULBU2RUL":RETURN
1390 DRAW"BU4RDLBD2RD":RETURN
1400 DRAW"BU2NE2F2":RETURN
1410 DRAW"BUR3BU2L3":RETURN
1420 DRAW"E2H2":RETURN
1430 DRAW"BU3UR3D2LBDD":RETURN
1440 DRAW"NR3U3ER2BD2LDRU":RETUR
N
1450 DRAW"U3ERFDNL3D2":RETURN
1460 DRAW"U4R2FGNL2FGL2":RETURN
1470 DRAW"BRREGLHU2ERF":RETURN
1480 DRAW"U4R2FD2GL2":RETURN
1490 DRAW"NR3U2NR2U2R3":RETURN
1500 DRAW"U2NR2U2R3":RETURN
1510 DRAW"BU4BR3L2GD2FREUL":RETU
```

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```
RN
1520 DRAW"U4D2R3U2D4":RETURN
1530 DRAW"R2LU4NLR":RETURN
1540 DRAW"BUFREU3":RETURN
1550 DRAW"U2RNF2NE2LU2":RETURN
1560 DRAW"NR3U4":RETURN
1570 DRAW"U4FRED4":RETURN
1580 DRAW"U4F3DU4":RETURN
1590 DRAW"BUU2ERFD2GLH":RETURN
1600 DRAW"U4R2FGL2":RETURN
1610 DRAW"BUU2ERFD2GNUNRLH":RETU
RN
1620 DRAW"U4R2FGL2RF2":RETURN
1630 DRAW"R2EHLHER2":RETURN
1640 DRAW"BU4R2LD4":RETURN
1650 DRAW"NU4R3U4":RETURN
1660 DRAW"BU4D3FREU3":RETURN
1670 DRAW"NU4ERFU4":RETURN
1680 DRAW"UE2UDGHUDF2D":RETURN
1690 DRAW"BU4DFEUDGD2":RETURN
1700 DRAW"NR2UE2UL2":RETURN
1701 '
1702 '
1703 ' CREATE THE CAD SYSTEM
1704 ' SCREEN (DISPLAY)
1705 '
1710 PMODE4,1:SCREEN1,1:COLOR0,1
:PCLS:DRAW"C0S4":TX=140:TY=5:T$=
"NAME: "+NF$:GOSUB100:TX=140:TY=
13:T$="PAGE:":GOSUB100:TX=184:TY
=13:T$="MEMORY:":GOSUB100
1720 FORX=0TO6:LINE(X*19+1,1)-(X
*19+20,20),PSET,B:NEXT:LINE(7,27
)-(248,184),PSET,B:LINE(6,26)-(2
49,185),PSET,B:GOSUB1760
1730 FORX=8TO248STEP8:LINE(X,27)
-(X,23),PSET:LINE(X+4,27)-(X+4,2
5),PSET:LINE(X,184)-(X,188),PSET
:LINE(X+4,184)-(X+4,186),PSET:NE
XT:LINE(252,23)-(252,191),PRESET
1740 FORY=28TO184STEP8:LINE(7,Y)
-(3,Y),PSET:LINE(7,Y+4)-(5,Y+4),
PSET:LINE(248,Y)-(252,Y),PSET:LI
NE(248,Y+4)-(250,Y+4),PSET:NEXT
1750 GOSUB1790:FORX=8TO248STEP8:
FORY=28TO184STEP8:PSET(X,Y):NEXT
Y,X:GOSUB110:A$=RIGHT$(STR$(PG),
1):DRAW"BM166,13":GOSUB80:RETURN
1751 '
1752 '
1753 ' MAIN MENU #1 DISPLAY
1754 '
1760 DRAW"BM4,4R6D12R6 BM24,4R12
D12L12U12 BM43,10R4NU3D3E3NH3RNU
3ND3R3 BM62,4R2BR3R2BR3R2D2BD3D2
BD3D2L2BL3L2BL3L2U2BU3U2BU3U2 BM
81,4R12L6D12 BM102,4D4NR6GFNR6GF
NR6GFND4R6ND4EHEHEHU4L6 BM119,8N
D4R6U4F6G6U4L6":RETURN
1761 '
1762 '
1763 ' MAIN MENU #2 DISPLAY
1764 '
1770 DRAW"BM4,10E6D4R6D4L6D4H6 B
M100,4R12D3L2DR2D8L6U3E2H2LG2F2D
3L5U12D3R6U3 BM28,8U4R4D4L4BD2F2
E2BD4R4D4L4U4BL4L4D4R4U4 BM46,4D
4NR6GFNR6GFNR6GFND4R6ND4EHEHEHU4
L6 BM62,4R4ND12R4ND12R4D4NL12D4N
L12D4L12U12 BM82,4NR3D4R3BDD4R3B
DND4R3D2L2NF2L"
1780 DRAW"BM122,6R4F2D4GNHFRLHGL
4H2U4E2":RETURN
1781 '
1782 '
1783 ' DISPLAY A PAGE BY GETTING
1784 ' INFO OUT OF MEMORY AND
1785 ' DRAWING IT ONTO THE
1786 ' SCREEN
1787 '
1790 AD(PG)=A(PG)
1800 D=PEEK(AD(PG)):IF D=0 THEN
RETURN
1810 X=PEEK(AD(PG)+1):Y=PEEK(AD(
PG)+2):AD(PG)=AD(PG)+3:IF D>50 T
HEN 1830
1820 DRAW"BM=X;,=Y;":N=D:GOSUB87
0:GOTO1800
```

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1. I/O -Commands
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DSKO$ FIELD FILES GET INPUT KILL
LSET OPEN PRINT PUT RSET

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CALL END EXEC FOR STEP NEXT
GOSUB GOTO IF THEN ELSE ERROR
ON..GO RETURN STOP SUBROUTINE

3. Math Functions
ABS ASC ATN COS CVN EOF
EXP FIX INSTR INT LEN LOG
LOC LOF PEEK POINT PPOINT RND
SGN SIN SQR TAN TIMER VAL

4. String Functions
CHR$ INKEY$ LEFT$ MID$ MKN$ RIGHT$
STR$ STRING$

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```
1830 IF D<>51 THEN 1850
1840 D=PEEK(AD(PG)): AD(PG)=AD(P
G)+1:IF D=255 THEN 1800 ELSE A$=
CHR$(D):DRAW"BM=X;,=Y;":GOSUB80:
X=X+5:GOTO 1840
1850 LX=PEEK(AD(PG)):LY=PEEK(AD(
PG)+1):AD(PG)=AD(PG)+2
1860 IF D=52 THEN LINE(X,Y)-(LX,
LY),PSET:GOTO 1800
1870 IF D=53 THEN LINE(X,Y)-(LX,
LY),PSET,B:GOTO1800
1880 IF D=54 THEN LINE(X,Y)-(LX,
LY),PRESET,BF:GOTO1800
1890 IF D<>55 THEN 1950
1900 IF LX<X THEN X1=LX:LX=X:X=X
1
1910 IF LY<Y THEN Y1=LY:LY=Y:Y=Y
1
1920 FOR X1=X TO LX STEP 8:Y1=X1
+4:IF Y1>LX THEN Y1=LX
1930 LINE(X1,Y)-(Y1,Y),PSET:LINE
(X1,LY)-(Y1,LY),PSET:NEXT:FOR X1
=Y TO LY STEP8:Y1=X1+4:IF Y1>LY
THEN Y1=LY
1940 LINE(X,X1)-(X,Y1),PSET:LINE
(LX,X1)-(LX,Y1),PSET:NEXT:GOTO18
00
1950 IF D<>56 THEN AD(PG)=AD(PG)
-5:POKE AD(PG),0:RETURN
1960 GET(X,Y)-(LX,LY),MD,G:LX=AB
S(X-LX):LY=ABS(Y-LY):X=PEEK(AD(P
G)):Y=PEEK(AD(PG)+1):PUT(X,Y)-(X
+LX,Y+LY),MD,AND:AD(PG)=AD(PG)+2
:GOTO1800
1961 '
1962 '
1963 '  PRINTOUT (WELL PART OF)
1964 '  ROUTINE, CHECK FOR FREE
1965 '  SPACE ON THE DISK
1966 '
1970 PRINT:PRINT"CHECKING FREE D
ISK SPACE":X=FREE(0):IF X<28 THE
N PRINT "NOT ENOUGH ROOM ON THE
DISK.":STOP ELSE PRINT "CREATING
 SUB PAGE IMAGE FILES.":FOR X=1
TO 1000:NEXT
1971 '
1972 '
1973 '  FOR EACH PAGE=> DRAW THE
1974 '  PAGE AND THEN SAVE IT
1975 '  AS PRT.PG# WHERE # IS THE
1976 '  PAGE NUMBER
1977 '
1980 FOR PG=0 TO 8:FL$="PRT.PG"+
RIGHT$(STR$(PG),1):PMODE4,1:SCRE
EN1,1:COLOR0,1:PCLS:GOSUB1790:SA
VEM FL$,&H0E00,&H25FF,&H0E00:NEX
TPG
```

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```
1981 '
1982 '
1983 ' RUN THE REST OF THE
1984 ' PRINTOUT PROGRAM
1985 '
1990 RUN "CADPRINT"
```

```
30 ........233
90 ........133
END .....170
```

Listing 2: CADPRINT

This program is called by the program *CoCocad* when a schematic printout is performed. The program was written for use with the Gemini-10 printer and will have to be modified if another printer is used.

```
0 '
1 ' CADPRINT   VR 1.0
2 ' (C) 1985 BY P.KERCKHOFF
3 ' 4335 HENDRIX WAY SAN JOSE CA
4 '
5 ' THE PRINTOUT PART OF THE
6 ' PROGRAM COCOCAD, USED WITH
7 ' THE GEMINI 10 OR 10X PRINTER
8 '
9 '
10 CLEAR100,&H379A:CLS:PRINT"cad
print RUNNING":CS=0:FOR X=&H379B
 TO &H37FF:READ A$:D=VAL("&H"+A$
):CS=CS+D:POKE X,D:NEXT:READ X:I
F CS<>X THEN PRINT "ERROR IN DAT
A STATEMENTS.":STOP
11 '
12 '
13 ' PICK YOUR BAUD RATE, 1=
14 ' 9600 BAUD
15 '
20 POKE150,1
21 '
22 '
23 ' SETUP LINEFEED LENGTH TO
24 ' 16/144THS OF AN INCH
25 '
30 PRINT#-2,CHR$(27);CHR$(51);CH
R$(16)
31 '
32 '
33 ' FOR EACH SUB PAGE OF THE
34 ' SCHEMATIC (LOOP)
35 '
40 FOR PG=0 TO 8 STEP 3
41 '
42 '
43 ' GET THE PAGES FROM DISK
44 ' AND STORE THEM IN MEMORY
45 ' (UPPER MEMORY)
46 '
50 LOADM "PRT.PG"+RIGHT$(STR$(PG
),1),&H2A00
60 LOADM "PRT.PG"+RIGHT$(STR$(PG
+1),1),&H4200
70 LOADM "PRT.PG"+RIGHT$(STR$(PG
+2),1),&H5A00
71 '
72 '
73 ' CALL THE MACHINE CODE
74 ' PRINTOUT ROUTINE POKED
75 ' IN EARLIER
76 '
80 EXEC &H379B
81 '
82 '
83 ' ERASE THE PAGES FROM THE
84 ' DISK AND LOOP UNTIL DONE
85 '
90 KILL "PRT.PG"+RIGHT$(STR$(PG)
,1):KILL "PRT.PG"+RIGHT$(STR$(PG
+1),1):KILL "PRT.PG"+RIGHT$(STR$
(PG+2),1):NEXT PG
100 PRINT:PRINT"DONE.":STOP
50000 DATA 86,FE,97,6F,86,1,34,2
,86,1B,AD,9F,A0,2,86,4B,AD,9F,A0
,2,86,D4,AD,9F,A0,2,86,1,AD,9F,A
0,2,35,2,8E,7E,E0,30,86,34,2,8D,
26,35,2,8E,66,E0,30,86,34,2,8D,1
B,35,2,8E,4E,E0,30,86,34,2,8D,10
,86,D,AD,9F,A0,2,35,2,4C,81,1F,2
6,B8,F,6F,39,C6,9C
50010 DATA A6,84,43,34,14,AD,9F,
A0,2,35,14,30,88,E0,5A,26,EF,39
50020 DATA  9974
```

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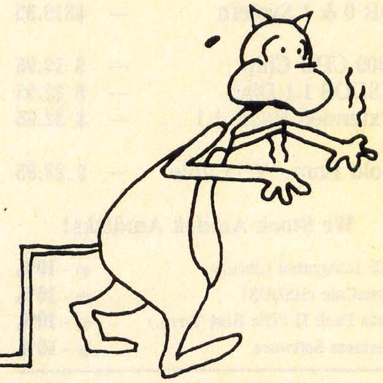

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Listing 3:

This program is a short machine language printer driver that is poked into memory and called by the *Cadprint* program.

```
                       00100
379B                   00110          ORG $379B
379B    7E      379B   00120 BEGIN    JMP     START
379E            0065   00130          FDB     DONE-BEGIN
                       00140
                       00150
                       00160          TITLE   CADCODE
                       00170
                       00180 * A ROUTINE TO QUICKEN
                       00190 * UP THE PRINTOUT
                       00200
379B                   00210          ORG $379B
                       00220
                       00230
                AA02   00240 CHROUT EQU       $A002   COCO'S OUTPUT ROUTINE
                006F   00250 DEVNUM EQU       $006F   =-2 FOR PRINTER
                       00260
                       00270
                       00280 * PRINT THREE SUB PAGES
                       00290 * OUT TO THE PRINTER
                       00300 * ASSUMES BAUD RATE HAS
                       00310 * BEEN SET AND PRINTER
                       00320 * IS ALL SET
                       00330
379B 86   FE           00340 START  LDA       #$FE    SET OUTPUT TO
379D 97   6F           00350        STA       DEVNUM  THE PRINTER
379F 86   01           00360        LDA       #1      SET X POS
37A1 34   02           00370 MLOOP  PSHS      A       SAVE IT, MAIN LOOP
37A3 86   1B           00380        LDA       #27     SET PRINTER UP
37A5 AD   9F A002      00390        JSR       [CHROUT]
37A9 86   4B           00400        LDA       #75     ESC,K (GRAPHICS MODE)
37AB AD   9F A002      00410        JSR       [CHROUT]
37AF 86   D4           00420        LDA       #212    468 BYTES AT A TIME
37B1 AD   9F A002      00430        JSR       [CHROUT]
37B5 86   01           00440        LDA       #1      468/256
37B7 AD   9F A002      00450        JSR       [CHROUT]
37BB 35   02           00460        PULS      A       GET X POS
37BD 8E   7EE0         00470        LDX       #$7EE0  BOTTOM SUB PAGE -
37C0 30   86           00480        LEAX      A,X     CALC ADDRESS=>X REG
37C2 34   02           00490        PSHS      A       SAVE X POS
37C4 8D   26           00500        BSR       PRINT   GO PRINT BYTES
37C6 35   02           00510        PULS      A       GET X POS
37C8 8E   66E0         00520        LDX       #$66E0  MIDDLE SUB PAGE
37CB 30   86           00530        LEAX      A,X
37CD 34   02           00540        PSHS      A
37CF 8D   1B           00550        BSR       PRINT
37D1 35   02           00560        PULS      A
37D3 8E   4EE0         00570        LDX       #$4EE0  TOP SUB PAGE
37D6 30   86           00580        LEAX      A,X
37D8 34   02           00590        PSHS      A
37DA 8D   10           00600        BSR       PRINT
37DC 86   0D           00610        LDA       #13     A CR/LF
37DE AD   9F A002      00620        JSR       [CHROUT]
37E2 35   02           00630        PULS      A       GET X POS
37E4 4C                00640        INCA
37E5 81   1F           00650        CMPA      #31     DONE?
37E7 26   B8           00660        BNE       MLOOP   NOPE, LOOP
37E9 0F   6B           00670        CLR       DEVNUM  YEP, SET OUTPUT FOR SCREEN
37EB 39                00680        RTS               EXIT TO BASIC
                       00690
37EC C6   9C           00700 PRINT  LDB       #156    Y COUNTER
37EE A6   84           00710 PLOOP  LDA       ,X      GET BYTE
37F0 43                00720        COMA              INVERT BITS
37F1 34   14           00730        PSHS      B,X     SAVE REG'S
37F3 AD   9F A002      00740        JSR       [CHROUT] PRINT BYTE
37F7 35   14           00750        PULS      B,X
37F9 30   88 E0        00760        LEAX      -32,X   NEXT Y ADDRESS
37FC 5A                00770        DECB              DONE ALL Y'S?
37FD 26   EF           00780        BNE       PLOOP   NOPE, LOOP
37FF 39                00790        RTS               YEP, RETURN
                       00800
                       00810
             3800      00820 DONE   EQU       *
             0000      00830        END
```

Listing 4: `REMOVREM`

This program will remove lines not evenly divisible by 10 from a program on disk saved in the ASCII format. (The program is used to remove the comment lines from *COCOCAD.REM.*)

```
0 '
1 ' REMOVREM
2 ' A VERY SIMPLE REMARK
3 ' REMOVER PROGRAM. REMOVES
4 ' LINES NOT EVENLY DIVISABLE
5 ' BY TEN.
6 '
7 ' (C) 1985 P.KERCKHOFF
8 '
9 '
10 CLEAR 500
11 '
12 '
13 ' OPEN THE OLD PROGRAM AS
14 ' AN ASCII FILE
15 '
20 OPEN "I",#1,"COCOCAD.REM"
21 '
22 '
23 ' OPEN A FILE FOR THE NEW
24 ' PROGRAM TO GO INTO
25 '
30 OPEN "O",#2,"COCOCAD.BAS"
31 '
32 '
33 ' IF END OF THE FILE THEN
34 ' WE'RE ALL DONE
35 '
40 IF EOF(1) THEN 80
41 '
42 '
43 ' GET THE DATA FROM THE OLD
44 ' FILE (PROGRAM)
45 '
50 LINEINPUT #1,A$
51 '
52 '
53 ' IF THE LINE NUMBER IS NOT
54 ' EVENLY DIVIS. BY TEN THEN
55 ' DON'T SAVE IT IN THE NEW
56 ' FILE (PROGRAM)
57 '
60 IF VAL(A$)<>INT(VAL(A$)/10)*1
0 THEN PRINT "REMOVED LINE: ";VA
L(A$):GOTO 40
61 '
62 '
63 ' ELSE THE LINE IS GOOD SO
64 ' SAVE IT IN THE NEW FILE
65 '
70 PRINT #2,A$:GOTO 40
71 '
72 '
73 ' ALL DONE. CLOSE IT AND
74 ' STOP.
75 '
80 CLOSE
90 PRINT "NOW LOAD 'COCOCAD.BAS'
 AND      RESAVE (THE LOAD WILL
TAKE QUITEAWHILE)."
100 STOP
```

Hint . . .

ONGOing Error Trapping

When you use an `ON . . . GOTO` or `ON . . . GOSUB` statement on the CoCo, you don't need to check for an out-of-range value. If the value presented is out of range, BASIC will skip the statement and jump to the next one. Here's an example:

```
10 INPUT "YOUR CHOICE";D
20 ON D GOTO 50,70,90,110:GOTO 10
```

If a number outside the range (here, less than '1' or greater than '4') is put in, the statement will be skipped and the next one (`GOTO 10`) will loop back to the `INPUT` statement.

Fred Kolesar
Westfield, PA

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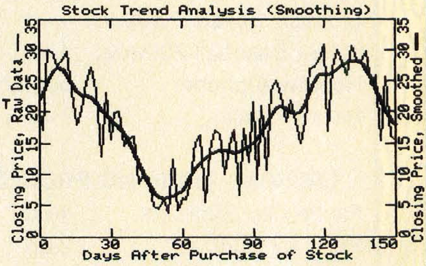

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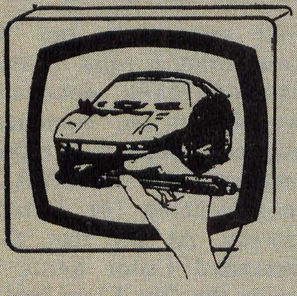

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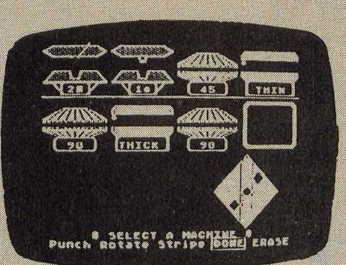

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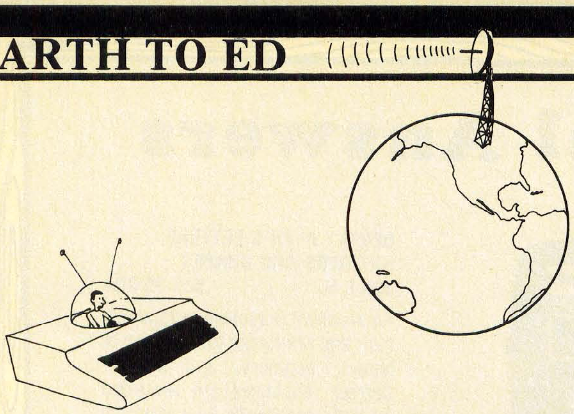

Reversing The Screen — Revisited

By Ed Ellers
Rainbow Technical Editor

• *I read your reply to the first letter in the August 1985 issue. Your method of turning all of the graphics screen to an inverse color (white to black, etc.) is good but slow. I have a faster way by using the* `NOT` *function of* `PUT`*. Here is my listing:*

```
5 'EL WHITE TO BLACK PROGRAM INV
ERSING:BY DAVID KELLER
10 DIM IN(108)
15 PMODE 4,1
20 SCREEN 1,1
25 FOR X=0 TO 192 STEP 17
30 PUT(0,X)-(255,X+16),IN,NOT
35 NEXT X
40 GOTO 40
```

David Keller
Fort Mill, SC

Thanks for the program. My own sample was just an attempt to show how it can be done; there's always room for experimentation and improvement.

A Rumor Behind Its Time

• *My question is about a rumor I heard about the new Disk BASIC 1.1 ROM coming out; if this is true or if it already came out, what does it have over Disk BASIC 1.0?*

Rick Cadorette
Biddeford, Maine

Disk BASIC 1.1 has been around since late 1983. The only advantage it has is a DOS command for booting OS-9. Many of the routines in 1.1 have been moved from their 1.0 locations, and quite a few programs that used them directly did not work with 1.1. For this reason I recommend sticking with 1.0.

Is It Extended, or Something Else?

• *I am 9 years old and just love to play with Dad's CoCo. When the new RAINBOW comes, I grab it and type in the "One-Liner Contest" listings from it. Sometimes they will not fit in, and my dad does something called "edit" and then they will fit. Dad says his computer is Extended and very long "packed" lines cannot be put into a standard computer. Can this be so?*

What do all the people without Extended do?

Natasha Swaine
Hantsport, Nova Scotia

That trick (using the `EDIT` mode to squeeze a few extra characters in) is quite common in our "One-Liners." Your father is right in that `EDIT` is an Extended BASIC command and isn't available on the "standard" models. I suspect, though, that a program that's been packed in this way is likely to have been written for Extended BASIC anyway. At any rate, those without Extended Color BASIC can always divide the One-Liner into two shorter lines in order to use them.

Reversed in Some Respects

• *I decided to try a hardware project in your April 1985 issue, the video reverser modification ("Turn Your Monitor Inside Out," Page 116). The project is relatively simple and after completing it, it worked fine, except when I went to the edit mode of* Telewriter-64*. The screen was again white with black lettering. My question is, is this normal, and if so, why?*

Bill Spillane
Phoenix, AZ

The video reverser project simply forces the 6847 video chip, *when it's in text mode*, to use the green-on-black

(Ed Ellers, a RAINBOW and PCM staff member, is a self-confessed electronics fanatic whose other interests include science fiction.)

characters instead of black-on-green. *Telewriter's* edit mode uses the `PMODE 4` Hi-Res screen, which is unaffected.

Forbidden Variables

● *When I have attempted to use the string variable designated as FN$, I get an error message. Why?*

Marc A. Schenider, Psy.D.
Evanston, IL

Some of Microsoft's several BASICs designed for various computers (including the CoCo's BASIC) are set up so you can't use variable names that are the same as commands or functions. In this case, Extended command `DEF FN` precludes the use of FN as a variable name. Later BASICs, like the BASIC on the IBM PC, let you do this, but these also make you type a space between a command word and the rest of the command (such as `FOR N = 1 TO 10`, instead of `FORN=1TO10`).

Limousine that Won't Start

● *In the January 1984 RAINBOW, Page 48, there is a disk utility for transferring programs from tape to disk. At the time I didn't have a disk system, so it has sat in my RAINBOW ON TAPE cassette for over a year. I now have a disk system and have need to use the program, only to find that it won't work. What happens is the program* `EXEC`*s, a question mark and some graphics characters appear in the first four of five columns in the upper left corner of the screen, and the cassette player motor starts. The computer is locked up at this point.*

I have wondered if there is an error in the program. I have not been able to locate the February or March 1984 issues to see if there is an errata. Could you please check for me?

Larry Cole
Bemidji, MN

The program in the magazine is correct, but in the process of making that month's RAINBOW ON TAPE, that file was damaged. The correct program *(TPTDSK)* was appended to the February 1984 RAINBOW ON TAPE, and (if I may be permitted a plug) anyone who needs to transfer tape files to disk will do well to consider it.

Modem Matters

● *What happens to the modem signal when it enters the serial I/O port? How is it processed, and in which memory locations? I am thinking of making a communications program. I want to know how the other programs access the serial I/O port, and how they translate all of those beeps into characters and characters into beeps.*

Robert Davis
Winnipeg, Manitoba

First of all, the "beeps" are handled in the modem, which takes DC signals from the computer and translates them into tones while translating the tones from the other end into DC signals for the computer. (In RS-232 interfaces, a '1' is represented by a positive voltage of three volts or more; a '0' is represented by a negative voltage, not by zero voltage as in a computer's own logic circuitry.)

The CoCo handles serial I/O using an inexpensive method that, unfortunately, makes terminal programs more complex. The serial input and output signals (shifted to the standard "TTL" levels) are connected to two input and output lines on the second PIA (Parallel Interface Adapter) chip. Input is fed to input bit 0 of Port B (at address FF22 Hex); output comes from output bit 1 of Port A (at FF20 Hex). This means the microprocessor itself has to take care of the Baud rate, number of start and stop bits and such. Understandably, this makes serial I/O on the CoCo somewhat unreliable and slow, especially when both sending and receiving are involved.

Many other computers use a circuit called a "Universal, Asynchronous Receiver/Transmitter" (UART for short), which can be programmed to take care of the Baud rate and number of bits automatically. The processor then sends the data to be sent out to the UART in parallel form and the UART sends it out serially, while also taking incoming serial data and converting it to parallel to send to the processor. Tandy's Deluxe RS-232 Program Pak and some other packs provide UART-based RS-232 ports for the CoCo, which make modem and other operations more reliable and faster as well as freeing up the CoCo's serial port for printer hookup.

Educational Programs

BASKETBALL STATISTICS
by Jeff Stevens

Coaches, let CoCo do the paperwork! Keeps each individual game, plus league, non-league and all game totals for a maximum of 16 players in up to 29 games. Stats can be kept in as many as 17 different categories — assists, steals, field goals, and free throw stats (made-attempted-percentages), offensive and defensive rebounds, turnovers, personal fouls, charges, playing time, quarters played and points. Totals for the opposition team and for your individual players are printable. Your season record and scores-to-date are available at any time. **Basketball Statistics** prints a year-end summary of each individual player on a game-by-game basis. Team stats for your team and the opponents' totals for the year are included. Menu driven — Easy to run — Excellent for most any basketball team.

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LONG DIVISION
by John Ashurst

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CoCo Community

We have compiled a list of Color Computer Clubs because of the many requests we have received. CoCo Clubs may wish to exchange newsletters, share ideas for topics of discussion at monthly meetings, etc.

Please let us know if we have omitted any clubs an send us complete up-to-date addresses. Only those clubs which have signed our "agreement form" will appear in this listing of CoCo Clubs. Also, please notify us if you wish to add or delete any names on this list. Send your information to:

CoCo Clubs
THE RAINBOW
The Falsoft Building
P.O. Box 385
Prospect, KY 40059

ALABAMA

Birmingham Alabama Color Computer Club, Robert Matthews, 3529 Laurel View Lane, Birmingham, 35216, (205) 933-0887

Huntsville Color-80 Users Group, Randy Niemann, 1011 Versailles Dr., S.E., Huntsville, 35803, (205) 882-2485

ALASKA

Alaska Color Computer Users' Group, Rick McDannel, 430C Beluga Ave., Ft. Richardson, 99505, (907) 428-0392

ARIZONA

Huachuca Hot Pokers, James Standley, 235-A Jeffords Street (NBU-96H), Ft. Huachuca, 85613, (602) 458-8338

Tucson Color Computer Club, Marshall R. Madole, 3721 S. Le Beaux Place, Tucson, 85730

ARKANSAS

Central Arkansas CoCo Club, Melinda Braslovsky, 1203 Erving Rdg., LP Cabot, 72023, (501) 982-8854

CALIFORNIA

Color America Users Group, Mark Randall, 2227 Canyon Rd., Arcadia, 91006, (213) 355-6111

Los Angeles-Wilshire Color Computer Users' Group, Norm Wolfe, P.O. Box 11151, Beverly Hills, 90213

The Davis CoCoNuts, Adam Sherman, 1818 Haussler Dr., Davis, 95616, (916) 758-3195

Sacramento Color Computer Club, Wayne Chrisope, P.O. Box 9, Elverta, 95626

North American CoCo - Orange County, Eric Wilson, 8405 Sweetwater Circle, Huntington Beach, 92646, BBS (714) 847-2268

Joe Bennett, 1169 Florida Street, Imperial Beach, 92023, (474-6213)

CoCoholics and Tandy Computer Club, Kenneth M. Denny, 801 W. Roseburg Ave., Suite 200, Modesto, 95350, (209) 523-5176

Ventura County Color Computer Club (VC4), John Bascue, Oxnard Public Library, 214 "C" Street, Oxnard, 93030, (805) 987-4752 or DATA (805) 484-5491

Sacramento CoCo Club, Charles Doughty, Box 60511, Sacramento, 95860

Salinas Color Computer Club, Larry Livingston, 501 Monterey Highway, Salinas, 93908, (408) 484-9697

Citrus Color Computer Club, Joseph Kohn, P.O. Box 6991, San Bernadino, 92412, (714) 792-8721

The MC-10 Newsletter Club, Jose J. Bray, 4730 Cass Street, San Diego, 92109, (619) 483-8744

Local Color—A CoCo Club of San Francisco, Andrew G. Kieval, P.O. Box 421242, San Francisco, 94142

San Joaquin CoCo Club, Steven Paul Moreno, P.O. Box 99024, Stockton, 95209, (209) 951-3938

Silicon Valley Color Computer Club, Shawn Jipp, P.O. Box 61593, Sunnyvale, 94088, (408) 749-1947

CoCo Nutz Computer Club, Walter V. Seay, 68-461 Highway 86, Thermal, 92274, (619) 397-4252

Conejo Color Computer Users Group, Robert S. Rimmer, 472 Sundance Street, Thousand Oaks, 91360, (805) 492-4972

South Bay Color Computer Club, Karen Schlotzhauer, 23113 Dana Ave., Torrance, 90501, (213) 539-2539

COLORADO

Lowry Microcomputer Club/CoCo Users' Group, Jerry D. Surritte, 2249 Moline St., Aurora, 80010, (303) 343-3273

Colorado Color Computer Club, Joe Applegate, P.O. Box 33492, Northglenn, 80233, (303) 650-9768

FLORIDA

Northwest Florida CoCo Nuts, William N. Lamb, P.O. Box 1032, Fort Walton Beach, 32549, (904) 244-5281

Alachua County CoCo Special Interest Group, Chris Meyers, P.O. Box 14927, Gainesville, 32604, (904) 378-9598

Jacksonville Color Computer Club, William H. Brown III, 2411 Hirsch Ave., Jacksonville, 32216, (904) 721-0282

CoCo Chips Color Computer Club, 6 Belle Mead Circle, Largo, 33540, (813) 581-7779

Broward County Color Computer Club, Timothy D. Neary, 510 S.W. 64th Ave., Margate, 33068, (305) 972-4074

South Brevard Color Computer Club, Benjamin S. Jerome, 496 Hillside Court, Melbourne, 32935, (305) 259-4609

The Naples CoCo Club, Matt Tari, 3320 7th Avenue S.W., Naples, 33964, (813) 455-4830

Color-6809 Users Group, Emery Mandel, 4301 11th Avenue North, St. Petersburg, 33713, (813) 323-3570

C.C. Club of Sarasota, Ernie Bontrager, 4047 Bee Ridge Rd., Sarasota, 33582, (813)921-7510

Broward CoCo Club, Sue Spahn, 11950 N.W. 29th Manor, Sunrise, 33582, (305) 741-4737

IDAHO

CoCo-AG Farm Computer Users Group, Kelly Klass, Rt.1, Box 4133, Twin Falls, 83301, (208) 733-4251

ILLINOIS

Glenside Color Computer Club, Ed Hathaway, 8 W. Stevenson Drive, Glendale Heights, 60139, (312) 462-0694

Town & Country CoCo, 5461 S. Kenwood, Chicago, (312) 493-3748

Cook County Color Computer Club, Tim Powers, 1633 Fifth Ave., Chicago Heights, 60411, (312) 747-7062

Illinois Color Computer Club of Elgin, Steven Stroud, 1098 Florimond Dr., Elgin, 60120, (312) 695-3186

Kitchen Table Color Computer Group, Robert Mills, P.O. Box 464, Hanover, 61041, (815) 591-3377

Northern Illinois Color Computer Club, 580 Milton Lane, Hoffman Estates, 60194, (312) 885-2573

Peoria Color Computer Club, Lawrence Parker, 418 Lakemper Dr., Metamora, 61548, (309) 383-4312

Motorola Microcomputer Club, Steve Adler, 1301 Algonquin Rd., Schaumburg, 60196, (312) 576-3044

Chicago OS-9 Users Group, 480 Gilbert Drive, Wood Dale, 60191, (312) 860-2580

INDIANA

Evansville Color Computer Users Group, Dave Jenkins, 1418 E. Illinois Street, Evansville, 47711, (812) 424-0099

Three Rivers Users Group, George Barber, 2410 New Haven Ave., Fort Wayne, 46815

Indy Color Computer Club, Mike Davis, P.O. Box 68702, Indianapolis, 46268, (317) 257-3300

Southern Indiana Computer Club, Route 1, Box 459, Mitchell, 47446

CoCo Program, Erik Merz, 310 Appletree Dr., Noblesville, 46060, (317) 842-1340

IOWA

Metro Area Color Computer Club, K.L. Knudtzon, 3324 11th Ave., Council Bluffs, 51501

Mid Iowa CoCo, Terry Simons, 1328 48th Street, Des Moines, 50311, (515) 279-2576

Dubuque Tandy Users Group, Wesley Kullhem, 1995 Lombard, Dubuque, 52001, (319) 556-4137

Iowa City TRS-80 Users Group, Susan Chapler, R.R. 6, The Woods, Iowa City, 52240, (319) 351-5959

KANSAS

Kansas City CoCo Club, Mike Allinder, P.O. Box 11192, Kansas City, 66111, (913) 287-1904

Topeka Color Computer Club, Kevin Cronister, 2224 Hope, Topeka, 66614, (913) 272-1353

Color Computer Club of Wichita, Rex Rivers, 1205 N. Mosley, Wichita, 67214, (316) 264-9193

Walnut Valley C.C. Users Club, David Anderson, 1212 E. 4th St., Winfield, 67156, (316) 221-0040

KENTUCKY

Perry County CoCo Users Group, Keith W. Smith, General Delivery, Hardburly, 41747, (606) 439-4209

LOCO-COCO, Mike Standefer, 3141 Doreen Way, Louisville, 40220, (502) 458-6690

LOUISIANA

Red Stick Color Computer Club, Gary Cash, 8929 Metairie Drive, Baton Rouge, 70810, (504) 293-7799

Cajun CoCo Club, Bob Hoevel, 104 Karen St., New Iberia, 70560, (318) 365-7706

MASSACHUSETTS

Greater Boston Super Color Users Group, Robert Biamonte, 6 Boulder Drive, Burlington, 01803

New England C.C. Users Group, Christopher E. Sweet, R.D. 2, Box 261, Harvard, 01451, (617) 456-8291

Massachusetts CoCo Club, Jason Rahaim, Spring St., Lunenberg, 01462, (617) 582-6514

6809'ers, Jean Salvas, 204 East Street, Springfield, 01104, (413) 734-5163

MICHIGAN

Petoskey Area CoCo Club (PAC³), Dennis Hoshield, 670 Liegl Drive, Alanson, 49706, (616) 347-0607

Color C.H.I.P.S., Jack Pieron, 3175 Oakhill Place, Clarkston, 48016, (313) 627-4358

Greater Lansing Color Computer Users Group, P.O. Box 14114, Lansing, 48901

Midland C.C. Club, Neil Drake, 709 Coolidge, Midland, 48640, (517) 631-2939

Michiana CoCo Club, Clay Howe, 310 S. Jefferson St., Sturgis, 49091, (616) 651-4248

MISSISSIPPI

Singing River C.C. Club, Mark Welch, 3605 Vancleave Rd., # 118, Gautier, 39553

CoCo Art Club, Joel Bunyard, Rt. 7, Box 10, Meridian, 39301, (601) 483-0424

MISSOURI

North County 80 Group, Tom Vogel, 12 Ville Donna Ct., Hazelwood, 63042, (314) 739-4078

Mid-America Color Computer User's Group, Jerry Morgon, 807 Ponca Drive, Independence, 64056, (816) 796-5813

Coconuts, 1610 N. Marlan, Springfield, 65803

MONTANA

Billings C.C. Club, Jayne Kenyon, 4306 Phillip, Billings, 59101

NEBRASKA

TRS-80 Color Computer Users Group of Lincoln, Jonathan Skean, 2629 South 15th St., Lincoln, 68502, (402) 475-9815

NEW JERSEY

Intrasoft, Ravi Sakaria, 139 Candace Lane, Chatham Twp., 07928, (201) 635-8025

The Kid CoCo Club, Derrick Kardos, 11 Regal Drive, Colonia, NJ 07067, (201) 382-6862

Bug 80 Users' Group, George R. Miller, Jr., Box 62, Glen Gardner, 08826

Garden State Color Computer Users Group, Darren Nye, 5 North 20th Ave., Manville, 08835; Voice (201) 725-8385, Data (C.C.I.E. BBS) (201) 725-5028

Loco CoCo Club, Bud Lavin, 73B Wavercrest Ave., Winfield Park, 07036

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Chaves County Color Computer Club, Lee Mitchell, 1102 Melrose Drive, Roswell, 88201, (505) 623-0789

NEW YORK

Adirondack CoCo Club (Albany Chapter), Ron Fish, Box 4214, Albany, 12204

Adirondack CoCo Club, (Athens Chapter), Pete Chast, P.O. Box 61, Athens, 12015

Adirondack CoCo Club (Glens Falls Chapter), Dave and Richard Mitchell, 39 Center St., Fort Edwards, 12828

Queensboro Color Computer Club, Bob Rosen, Springfield Blvd. & 56th Ave., Bayside, 11364, (212) 631-6233

Local CoCo, Charles Martin, P.O. Box 901, Bellmore, 11710

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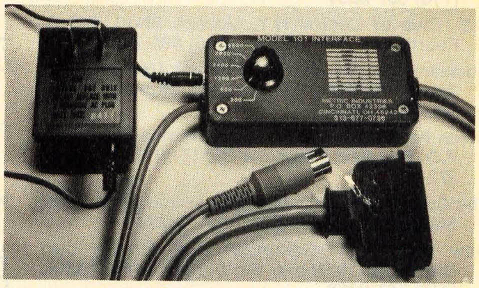

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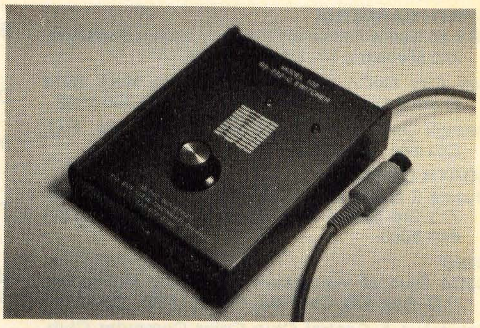

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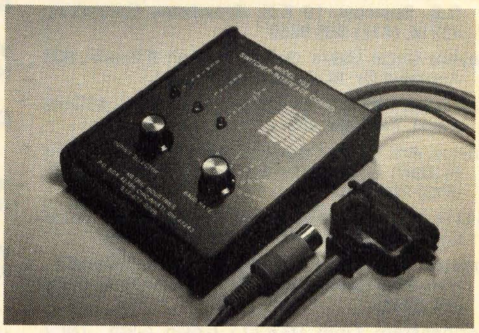

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Rockland County Color Computer Users Group, John S. Scibran, P.O. Box 131, Monsey, 10952, (914) 357-5580

Olean Area CoCo Users Group, Herman L. Smith, P.O. Box 216, Olean, 14760, (716) 372-1170 or 372-3121

The CoCo Clan, John David, 56 Willowwood Lane, Staten Island, 10308, (718) 317-6228

New York Color Computer User Group, Carl Glovinsky, 15 Bolivar St., Staten Island, 10314, (718) 761-0268

NORTH CAROLINA

TRS-80 Users' Group of Charlotte, Jason Foodman, 240 Medearis Dr., Charlotte, 28211

Bull City CoCo Users Group, Todd Wall, 5319 Durand Drive, Durham, 27703, (919) 598-1348

Raleigh Color Computer Club, David Roper, P.O. Box 681, Garner, 27529

NORTH DAKOTA

Musica 2 Users Group (MUG), Solveig Pederson, 711 3rd Street S.E., Valley City, 58072, (701) 845-5063

OHIO

CoCo Club of Youngstown, Timothy McFadden, P.O. Box 478, Canfield, 44406, (216) 788-4218

Columbus & Central Ohio Color Computer Club, D.E. Sparrow, 19 E.N. Broadway, Columbus, 43214, (614) 268-5366

Dayton CoCo Users' Group, Joseph P.Evans, 609 Applehill Dr.,W. Carrollton, 45449

Cincinnati TRS-80 Users Group, R.A. White, 44 Dow Court, Fairfield, 45014

Dayton Are Color Computer Users Group, David R. Barr, 2278 Yorkshire Pl., Kettering, 45419, (513) 293-2228

M.U.G. of CoCo—Middletown Users Group, James Carr, Middletown, 45042, (513) 424-6905

Greater Toledo Color Computer Club, Ronald L. Hall, 9646 Garden Road, Monclova, 43542, (419) 865-3663

Northeastern Ohio (N.E.O.) CoCo Club, Tony Rugue, 527 Malvern Drive., Painsville, 44077, (216) 354-2736

Tri-County Computer Users Group, William J. Loeffler, 2612 Dale Avenue, Rocky River, 44116, (216) 356-0779

Miami Valley CoCo Club, R. Douglas Wales, 2065 LeFeure Rd., Troy, 45373

OKLAHOMA

CoCo Inc., Robert L. Pace, 1726 W. Rose Oak Dr., Mustang, 73064, (405) 376-3569

OREGON

Willamette Valley CoCo Users, Brian James, P.O. Box 11468, Eugene, 97440, (503) 687-9286

PENNSYLVANIA

HUG-A-CoCo, George Lurie, 2012 Mill Plain Court, Harrisburg, 17110, (717) 657-2789

Penn-Jersey Color Computer Club, P.O. Box 2742, Lehigh Valley, 18001

CAPATUG, Inc., 340 Lewisberry Rd., New Cumberland, 17070, BBS (717) 774-6543

Skyline Color Computer Club of Berks County, Lewis F. Brubaker, 4874 Eighth Ave., Temple, 19560, (215) 921-3616

Pittsburgh Color Group, William Tucker, P.O. Box 351, West Mifflin, 15122, (412) 466-3078

RHODE ISLAND

New England CoCo Nuts, P.O. Box 6604, Providence, 02940

SOUTH CAROLINA

Invitation Software Group, Tom Reed, 3562 Linbrook Dr., Columbia, 29204, (803) 786-0541

Midlands 80 Computer Club, Tommy Sanders, P.O. Box 7594, Columbia, 29202, BBS (803) 755-3414

Metropolitan Greenville CoCo Club, Ed Lowe, P.O. Box 6, Gray Court, 29645, (803) 876-3928

Hilton Head Island CoCo Club, Kevin Clark, P.O. Box 6187, Hilton Head Island, 29928, (803) 785-9630

Spartanburg County CoCo Club, Dennis Shattuck, 473 Royal Oak Drive, Spartanburg, 29302, (803) 583-3017

TENNESSEE

Chattanooga CoCo Club, Jim Perkins/Jim Cox, P.O. Box 9825, Chattanooga, 37412, (615) 870-2439

Foothills Micro-Computer Club, Aaron Sentell, Route 14, Box 289, Maryville, 37801, (615) 982-4629

Memphis Color Computer Users Group, Ben Barton, 4903 Warrington Rd., Memphis, 38118, (901) 795-7075 or 362-5945

TEXAS

CoCo User Group, David Karam, 1809 Dexter, Austin, 78704, (512) 442-6317

B/CS Color Computer Users Group, Dale Cuthbertson, 1812 Michael Lane, Bryan, 77801, (409) 822-0731

Deer Park Color Computer Club, Donald Burr, 4314 W. Grant, Deer Park, 77536, (713) 479-5313

International Color Computer Club, Inc., Robert L. Garrett, 2101 East Main Street, Henderson, 75652, (214) 657-7834

TRS-80 Users Group of New Braunfels, John Mendez, 408 Acorn, New Braunfels, 78130, (512) 629-3207

UTAH

Ogden CoCo, Kathy Rush, 4535 S. 2600 W. Roy, Ogden, 84067

Salt City CoCo Club, Dennis Mott, 720 E. Browning Ave., Salt Lake City, 84105, (801) 487-6032

VIRGINIA

Northern Virginia C.C. Club, Bruce Warner, 14503 Fullerton Road, Dale City, 22193, (703) 670-4962

Central Virginia Color Computer Club, Lane Lester, 413 Woodland Circle, Lynchburg, 24502, (804) 237-4188

WASHINGTON

Northwest Computer Club, Larry Haines, East 2924 Liberty, Spokane, 99207, (509) 483-5547

WEST VIRGINIA

Kanawha Valley Personal Computer Club, P.O. Box 5354, Charleston, 25311, BBS (304) 925-3338 or 345-6502

Mtn. State CoCo Users Group, Donald G. Barber, Jr., P.O. Box 1084, Morgantown, 26507, (304) 599-4493

Mil-O-Bar Computer Club, Jim LeMaster, P.O. Box 130, Ona, 25545, (304) 743-4752 after 4 p.m.

Blennerhassett CoCo Club, David Greathouse, Rt. 9, Box 119, Parkersburg, 26101

West Virginia Color Computer Club, William Mucklow, 949 Baier Street, St. Albans, 25177, (304) 727-6764

WISCONSIN

CoCo-MUG, Tom Fandre, P.O. Box 10152, Milwaukee, 53210, (414) 542-0600

Southern Wisconsin CoCo Club, David C. Buehn, P.O. Box 411, Twin Lakes, 53181

CANADA

ALBERTA

Calgary Color Computer Club, Don Towson, 832 Cannell Rd. S.W., Calgary, T2W 1T4, (403) 281-2855

Edmonton CoCo Users Group, Dexter Dombro, P.O. Box 4507 Stn. South, Edmonton, T6E 4T7, (403) 461-4750

Medley Computer and Electronics Club, P.O. Box 1267, Medley, T4A 2M0

NEW BRUNSWICK

Color Computer Moncton Users Group (CoCoMUG), Leo Allain, 91 Woodland Dr., Moncton, E1E 3C4, (506) 382-2190

BRITISH COLUMBIA

North Island CoCo Club, Ann Marie MacKay, P.O. Box 1740, Port Hardy, B.C., V0N 2P0

Salmon Arm CoCo, David Coldwell, 2981 N. Broadview, Salmon Arm, B.C., V0E 2T0, (604) 832-8247

MANITOBA

Winnipeg Micro-80 Users Group, Mel Seder, 884 Ash St., Winnipeg, R3N 0R9, (204) 284-0376

NEWFOUNDLAND

Avalon CoCo Club, A.R. Thompson, 10 Foran St., St. John's, A1E 4G1

NOVA SCOTIA

Halifax Dartmouth CoCo Users Group, P.O. Box 572, Dartmough, B2Y 3Y9, (902) 469-3656

ONTARIO

International Adventurer's Club, Maurice Dow, 84 Camberley Cres., Brampton, L6V 3L4

K-W C.C. Club, Peter Karwowski, 23 Hudson Crescent, Kitchener, N2B 2V7

London CoCo Nuts Computer Club, Harry K. Boyce, 180 Concord Road, London, N6G 3H8, (519) 472-7706

Meadowvale Color Computer Club, Howard Porter, P.O. Box 186, Streetsville, Mississauga, L5M 2B8

Niagara Regional CoCo Club, Harry VanDyke, 7707 Jubilee Drive, Niagra Falls, L2G 7J3

Ottawa 6809 Users Group, Norm Shoihet, 1497 Meadowbrook Road, Ottawa, K1B 5J9, (613) 741-1763

QUEBEC

Club d'Ordinateur Couleur du Quebec, Inc., Jean-Marie Beaujean, Centre de Loisirs St-Mathieu, 7110- 8e Ave., St-Michel, Montreal, H2A 3C4, (514) 270-7507

South Shore CoCo Club, Jacques Bedard, 33 Lisilre, St-Constant, P.Q., J0L 1X0

Le Club Couleur du Nord, Gabriel Pigeon, RR 2, Ville Montel, J0Y 2S0, (819) 732-2346

SASKATCHEWAN

Regina Color Computer Club, Georges Glass, 26 Tweedsmuir Bay, Regina, S4X 2B1, (306) 949-3942

Saskatoon Color Computer Club, L. Curtis Boyle, 35 Bence Crescent, Saskatoon, S7L 4H9

AUSTRALIA

Blacktown City TRS-80 Colour Computer Users Group, Keith Gallagher, P.O. Box 264, Riverstone, New South Wales, 2765

CoCo Colyteens of Colyton, Dwayne Manson, P.O. Box 506, St. Marys, New South Wales, 2760

Color Computer Penrith User Group, Alexander Schofield, 15 Tasman Avenue, Lethbridge Park, New South Wales, 2770

The Hills District Color Computer Club, Andrew Rankin, 42 Lucas Road, Seven Hills, New South Wales, 2147, phone (02) 674-3741

CoCoHUG (Color Computer Hobart Users Group), Robert Delbourgo, 15 Willowdene Avenue, Sandy Bay, Hobart, Tasmania, 7005

MEXICO

MEXCOCO Users Group, Sergio Waisser, Pachuca 87-109, Mexico City D.F., 06140, phone 553-11-98

WEST GERMANY

First CoCo Club Hamburg, Theis Klauberg, 2000 Hamburg 65, Op de Solt 53 a, West Germany

new clubs

Editor:

I'd like to announce the formation of The CoCoholics and Tandy Computer Club of Modesto. We hold meetings once a month and ask that anyone who joins pay an annual fee of $18 to help publish our *COLOR* newsletter. For more information write us at 801 W. Roseburg Ave., Suite 200, 95350.

Ken Denny
Modesto, CA

Editor:

For information about joining the Orange County TRS-80 Users Group write to 10112 Melody Park Drive, 92640.

Fred K. Wright
Garden Grove, CA

Editor:

The Color Computer Club of Riverview holds monthly meetings on the second Friday of each month at 7 p.m. We have a bimonthly newsletter. The club offers programming help, hardware hacking and any information or assistance available. Write to 13002 Lincoln Road, 33569.

Jessie A. Ray
Riverview, FL

Editor:

This letter is to inform you of the existence of the Color-6809 Color Computer Users Group. We have about 50 members and meet the third Monday of each month. Usually, we have a speaker at our meetings. We publish a newsletter once a month and have both public domain software and firmware libraries. All residents of Pinellas, Hillsborough, Pasco and other counties of Florida are welcome to attend our meetings; anyone is welcome to inquire with us for further information about our club. Write to 4301 11th Avenue North, 33713 or call (813) 323-3570.

Emery Mandel
St. Petersburg, FL

Editor:

I am happy to announce the formation of a new CoCo club in the Hazard-Perry county area called the Perry County CoCo Users Group. Inquiries about the club should be sent to General Delivery, 41747.

Keith W. Smith
Hardburly, KY

Editor:

The Greater Kalamazoo Color Computer Club meets the third Wednesday of every month in the Community Room of the Crossroads Mall. The meetings start at 7:30 p.m. Along with club meetings we publish a newsletter. The club also has a 150-program public domain library. For more information call Mike at 657-3850 or Jim at 344-7631.

Michael Marcelletti
Paw Paw, MI

Editor:

A new national CoCo Art Club is starting in Meridian. We plan to have a monthly newsletter, discount prices on software, contests, a CoCo gallery (similar to THE RAINBOW's), software library, BBS/DATA library (just for art) and many other features. If anyone has any ideas or would like to become a member please write to CoCo Art Club, Rt. 7, Box 10, 39301.

Joel Bunyard
Meridian, MS

Editor:

I am interested in starting a Color Computer club in the St. Louis county area. Anyone interested can contact me after 5 p.m. at (314) 739-0326 or write to 11826 Gay Glen Drive, 63043.

Jay Harris
Maryland Heights, MO

Editor:

This is to announce a new chapter in the Adirondack Color Computer Club. The Greene County chapter meets in the Athens Elementary School the second and fourth Thursday of each month at 7 p.m. during the school year.

We have chapters in Glens Falls, Fort Edward, Albany and now Greene County. Our members are widespread and we are constantly looking for more people to organize new chapters. Write to P.O. Box 61, 12015.

Pete M. Chast
Athens, NY

Editor:

I would like to announce the formation of the New York Color Computer Group. The club meets on the second Thursday of each month at Clove Lakes Nursing Home, Fanning Place in Staten Island. The meeting time is 7 p.m. For more information please send an SASE to P.O. Box 626, 10314.

Brian Twomey
Staten Island, NY

** SUPER SUMMER HALF PRICE SALE ** FOR A LIMITED TIME ONLY, THE KEY TO 64K (KEY-264K) CAN BE YOURS FOR $19.95 (Cass) or $21.95 (Disk)

*** Works with CASSETTE based systems! ***   *** Works with DISK based systems! ***

The KEY-264K divides the 64K ram memory into two 32K banks or sides, each of which can be utilized independently by the BASIC interpreter, with the ability to switch instantly from one side to the other. IT'S LIKE HAVING TWO COMPUTERS IN ONE!! Have your BASIC program on one side and keep your variables on the other side, or have your main program on one side and your subroutines on the other side, or have your program on one side and use the other side for 4 additional HI-RES pages, or any combination you like. The possibilities are endless because the KEY-264K allows full communication between sides plus the ability to switch back and forth at will, all from within BASIC. You could also have different programs in each side and switch back and forth between them using simple keystrokes, even while the programs are running!! Or run them both at the same time in the FOREGROUND/BACKGROUND MULTI-TASKING mode. Don't buy that printer buffer yet! With the KEY-264K you can be printing in the background side while utilizing your computer normally in the foreground side AT THE SAME TIME!!! Debugging a program? Use either a BASIC command or simple keystrokes to instantly duplicate your program, in it's present status, on the opposite side. Switch to the opposite side later and pick up exactly where you were before!

For DISK users, the KEY-264K allows you to alternate between DISK and EXTENDED BASIC on the same side with simple keystrokes. No need to pull your controller or power down. You can be in EXTENDED BASIC on one side and in DISK BASIC on the other side and still switch back and forth and have full communications between the two sides.

The KEY-264K does this and MORE thru extensions to BASIC. No need to learn a new language! The KEY-264K adds 15 NEW COMMANDS and 1 function to BASIC, including powerful new BLOCK MEMORY MOVE and GRAPHICS VIEWING commands.

The KEY-264K works on ANY 64K COCO or 64K COCO-2 and on older 32K systems with "E", "F", or even modified "D" boards and requires EXTENDED or DISK BASIC (R.S. only, not for JDOS or others) with GOOD 64K MEMORY CHIPS !!

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RAINBOW CERTIFICATION SEAL

Editor:

The Rockland County Color Computer Users Group holds monthly meetings at the Cooperative Extension in New York City. In addition to regular meetings the club plans to publish a monthly newsletter. For additional information you may call 357-5580 between 10 a.m. and 2 p.m. or Harold Laroff at (914) 425-2274 in the evenings. The clubs mailing address is P.O. Box 131, 10952.

Harold L. Laroff
Monsey, NY

Editor:

To anyone interested in forming a Color Computer club in Suffolk County Long Island please give me a call at (516) 475-3957 or drop me a line at P.O. Box 485, 11772.

I would also be grateful to those of you that run a Color Computer club, or belong to one, if you would send me some advise or ground rules for a club to get started.

William C. Mulvey
Patchogue, NY

Editor:

I am pleased to announce the beginning of the CoCo Clan. Its newsletter is packed with programs, game and programming hints, game reviews and contests. Also, there are special discounts on programs we are selling. The club is run by teenage computer whizzes who are anxious to show their programming skills. Anyone interested in joining should write to 56 Willowwood Lane, 10308.

John Davis
Staten Island, NY

Editor:

The San Antonio Color Computer Club offers membership to the club for $25 per year. We offer a newsletter, contests and awards, low cost disks and drives, discounts on software and hardware items, plus more. For information write to 2430 Rawhide Lane, 78227.

James Leatherman
San Antonio, TX

Editor:

This is to announce the formation of The Skyline Color Computer Club of Berks County. We hold meetings on the third Friday each month. We teach BASIC programming and have software and hardware demonstrations. We also have classes on graphics and telecommunications. Interested users may call Louie Brubaker at (215) 921-3616 after 6 p.m. for more information.

John K. Weidman
Hamburg, PA

Editor:

Would you inform your readers of a free CoCo club. It has no meetings. To find out what it's about send an SASE to 217 Graves Road, 37379.

Computer Master
Soddy Daisy, TN

Editor:

I would like to announce the emergence of another CoCo club in the southeast Wisconsin area. Johnson Laboratories, Inc. is a new users group for anyone who would like to join. You can call (414) 639-1028 or write to me at 4132 North Greenbay Road, 53404.

Shawn A. Johnson
Racine, WI

Editor:

The Ottawa 6809 Users Group is a nonprofit club devoted to the Color Computer and other 6809-based computer systems. We have meetings on the third Monday of each month in which we discuss and demonstrate new products available for the CoCo and answer questions and problems from the members. For information contact me at (613) 225-3122 or Norm Shoihet at (613) 741-1763.

In addition, there is an OS-9 users group in Ottawa which meets on the second Tuesday of each month. Inquiries may be addressed to 3 Woolmsley Cres., Canada K2G 1J3.

David Buck
Nepean, Ontario

Editor:

The Winnipeg Micro-80 Users Group meets alternate Saturdays at 9:15 a.m. in Room 205, Technical Vocational High School, 1500 Wall Street. We feature a speaker at every meeting and give courses in BASIC and assembler. Phone Murray Day at 257-3537 or write to me at 108 Kingsway Ave., Canada R3M 0G9.

Mrs. C.C. Blunderfield
Winnipeg, Manitoba

Editor:

There is now another Australian CoCo club in existence. The Hills District C.C.C. meets every fortnight for three hours and is devoted to our CoCos. We are looking for clubs to correspond with from any part of the world. Correspondents can write to the following address.

Andrew Rankin
Hills District C.C.C.
42 Lucas Road, Seven Hills
N.S.W., Australia 2147

Editor:

We are here! The 6809 Color Club. We are up to 200 members. We like the topics that have been published in THE RAINBOW magazine. RAINBOW is by far the best CoCo magazine in our country. Interested persons can write to me at the following address.

Francisco R. Maia Sobral
Real Grandeza, 219, Bloco C, sala 1102
Rio de Janeiro, Brazil
CEP 22283

Editor:

I proudly announce the Color Computer Users Group in Antwerp (Belgium). The group cooperates intensively with six other independent groups in Belgium and in the Netherlands. Together we have almost 1,000 members. We are interested in any kind of application or program for the Color Computer. If you are interested please write me at the following address:

Jorgen te Giffel
Eikenlaan 1
4641 GB Ossendrecht
the Netherlands
01131-1647-2214

One-Liner Contest Winner . . .

This One-Liner shows a missile flying to its target and detonating.

The listing:

```
0 PMODE4:PCLS:SCREEN1:X=128:Y=19
0:CIRCLE(X,Y),150,,.25:PAINT(X,Y
),,1:FORA=.6TO1STEP.02:CIRCLE(X,
Y),100,0,1,A-.02,A:CIRCLE(X,Y),1
00,,1,A,A+.02:NEXT:LINE(220,Y)-(
226,140),PSET,BF:FORA=1TO10:CIRC
LE(223,140),A,,.5:NEXT:FORA=0TO1
:A=0:B=1-B:SCREEN1,B:NEXT
```

Eric Ball
Calgary, Alberta

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Simulations* and its companion *Rainbow Simulations Tape*.)

One-Liner Contest Winner . . .

This One-Liner is hard to describe without giving it all away. Try it and see why!

The listing:

```
20 PMODE3,1:SCREEN1,0:PCLS3:X=82
:Y=154:FORR=1TO4:CIRCLE(X,Y),160
+(20*R),2,.6,.4,1:NEXT:FORM=4TO6
:PAINT(Y,(M*8)-3),M,2:NEXT:CIRCL
E(X,Y),240,4,.6:CIRCLE(X,Y),220,
1,.6:COLOR3,2:DRAW"BM0,0;D191R25
5U191":FORX=0TO99999:NEXT
```

Barbara Paquin
Weymouth, MA

(For this winning one-liner entry, the author has been sent copies of *The Rainbow Book Of Simulations* and its companion *Rainbow Simulations Tape*.)

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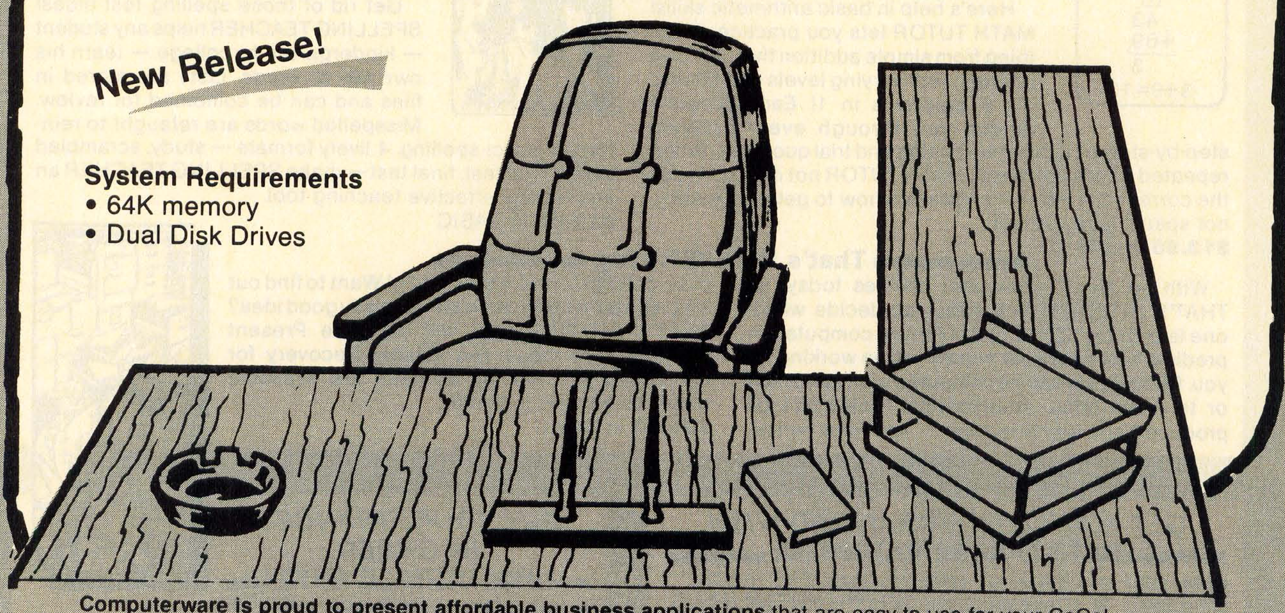

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This is a comprehensive double-entry accounting system with complete audit trails, closing procedures, and full reporting. The chart of accounts is flexible and the system easy to use. Reports include the General Ledger, Trial Balance, Balance Sheet, Income Statement, and Transaction Register. Your financial information is at your fingertips!

CHECK LEDGER $125

This is a single-entry bookkeeping system which allows the users to define a chart of income and expense accounts. Year-to-date totals are maintained for each account as well as complete checking account history. By just entering your checking account information, you can have always-current visibility over your income and expense ledgers. Financial statements and taxes are a snap!

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This is the most comprehensive payroll you'll find on a micro-computer. Besides collecting key employee information, it allows entry of pay rates for standard hours, overtime, and salary. Hourly, salary, and commissioned employees may be paid weekly, bi-weekly, semi-monthly, and monthly. Two types of special monthly deductions are also accommodated. Year-to-date, quarterly, monthly and current totals are maintained. All federal reporting is done automatically and your state computations are also included.

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This system is designed to help the retailer, distributor, or businessman to keep control of this important factor. It stores your cost and quantity information, updates it immediately, and offers you key management reports with useful summaries at any time. With four costs, four locations, selling history, and vendor information for each item, you will always have the facts!

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This system can give you the tools to plan your business' growth by controlling expenditures and forecasting cash requirements. It helps a small business manage and track its cash liabilities by collecting vendor invoice information and reporting the business' cash commitments and payment history. Along with standard payables reports, it also includes a check writer and payment forecast reports.

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All businesses need to know who owes them money! This system provides reliable and timely information regarding the status of all customer accounts. You can know instantly which accounts are past due, forecast how much money to expect to receive for cash flow planning, and keep on top of your customers' credit positions. Customer name, address, credit limit, invoice, and payment information is recorded and reports of all information including customer statements are available upon your request.

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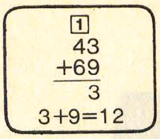
```
 1
  43
 +69
   3
3+9=12
```

Here's help in basic arithmetic skills! MATH TUTOR lets you practice everything from simple addition through long division, with varying levels of difficulty. It's 5 programs in 1! Each program guides you through every problem step-by-step including regrouping and trial quotients. When repeated errors are made, MATH TUTOR not only provides the correct answer — it shows you how to get it! Accuracy, not speed, is rewarded!

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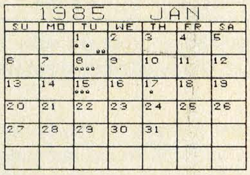

1985			JAN			
SU	MO	TU	WE	TH	FR	SA
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Puts YOU in charge of your schedule! ■ Graphically displays any monthly calendar between 1700 and 2099. You put in up to twelve 28 character memos per day . . . calendar shows where the memos are . . . call up of day shows details. ■ Use for appointments or a log of past activity. ■ Search capability allows you to list or print all memos between two specified dates or only ones meeting key-word criteria. ■ Date computation shows elapsed time between two dates in days, weeks, months and years. ■ Printed graphic calendar available with optional Graphic Screen Print Program. ■ Requires 32K in BASIC

TAPE DATE-O-BASE CALENDAR - $16.95 (max. 400 memos/tape file) **DISK DATE-O-BASE CALENDAR - $19.95** (over 4000 memos/disk . . . max. 300 memos/month)

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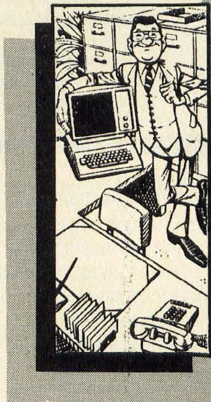
PUT YOUR FINANCES IN ORDER

DISK DOUBLE ENTRY



If you have spent hours trying to balance your Debits and Credits, DISK DOUBLE ENTRY is for you! ■ Designed for small business, club and personal use. ■ Enter transactions in a journal type format. Program will maintain current account balances, produce Trial Balance, Income and Balance Sheet reports and complete Account Ledgers. ■ Will handle up to 300 accounts including report headings and totals. ■ Up to 1400 average transactions on a diskette. ■ Summary reports and four levels of subtotals available. ■ Requires 32K and an understanding of standard double entry accounting concepts.

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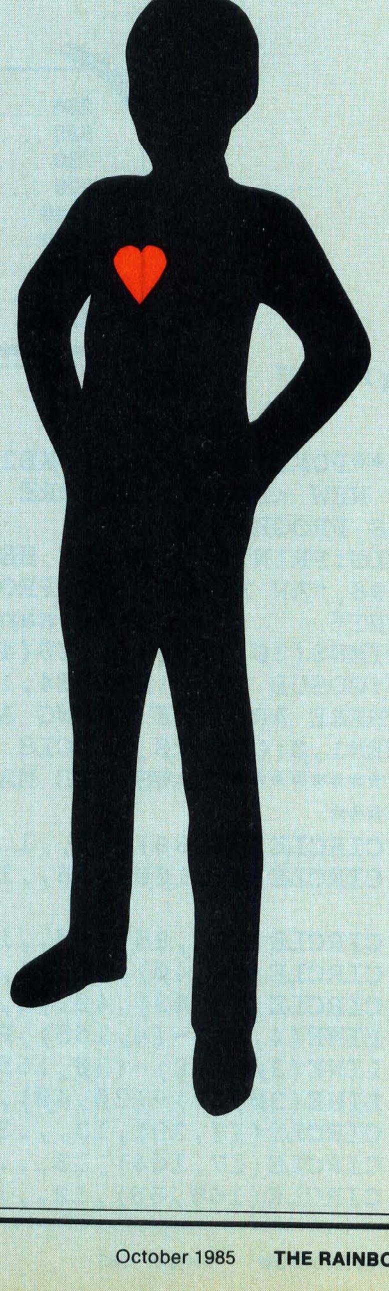
32K
ECB

Using association to learn the parts of the heart

A LESSON STRAIGHT FROM THE HEART

By Denis Santerre

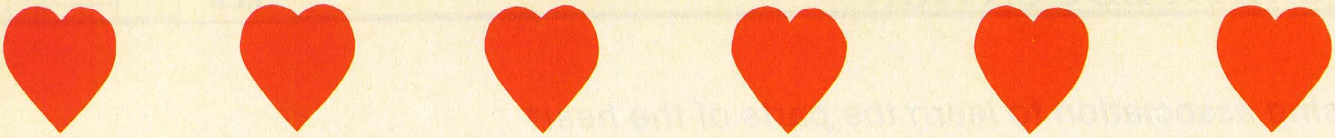


The CoCo is a wonderful machine for learning. It is an asset when association is helpful. In the September 1984 issue of THE RAINBOW, Joseph S. Paravati showed us how association can be used to learn the states and capitals ("GeoGraphics," Page 177). From his program I got my character data, which he had gotten from *TRS-80 News*, April 1982, by R. Van Dyke.

Heart Quiz is a program that uses association to learn the parts of the heart. Before you load the program, type `POKE 23040,0 : POKE 25,90` and ENTER, then type `NEW` and ENTER. This will clear the memory for 12 pages of graphics instead of the usual eight. If you do the poke after you load in the program, it will be gone, so be sure to save it as soon as it is typed in.

When you run the program the computer will draw the heart in two locations in memory. These two drawings are a little different: one is the outside of the heart and the other is the inside chambers. For each part, the program will select one of these two drawings; it then will copy the selected drawing. To this drawing it will add the needed graphics for the part that is to be identified. By switching pages back and forth, this added graphics will give a flashing image until a key is hit.

(Denis Santerre is a biomedical equipment technician at Eastern Maine Medical Center. He is a self-taught computer hobbyist.)



As an aid to the clues, the length of words is given with dashes. Spaces, numbers and unrelated keys will be ignored. The back-arrow key will clear all you have typed in and let you change your answer. If the answer is wrong, the correct answer will be given. Your score will be shown as a percentage of correct answers to the total answers. A new part of the heart is selected and the routine is repeated.

The heart is only one of the many subjects that can be learned with this type of program. To select your own drawings and words, simply replace the ones in *Heart Quiz* with your own. To make the drawing easier, a temporary routine at the end of the program will help. This will let you find line lengths, DRAW statements and circle sizes.

I have included such a program. Type in Listing 2 at the end of the program into which you want to put DRAW statements. From the menu, select the function you want: CIRCLE, LINE, BOX or DRAW. The joysticks and keyboard are used to control the size and shape of the added feature; typing X and pressing ENTER will give the statement needed for the added feature.

You can use the space I left to put each new graphics line as it comes up (see remark lines). If you prefer, you can put your lines anywhere as long as you put RETURN at the end of your last line and change the GOSUB line number on Line 540.

(If you have any questions about *Heart Quiz*, you may contact Denis at Rt. 1, Box 511, E. Holden, ME 04429, phone 207-947-3711. If you write, please include an SASE.) ☐

250	153
520	185
750	8
899	23
1040	210
1160	229
1250	5
1410	93
END	183

Listing 1: HEART

```
0 '***POKE 23040,0:POKE25,90 <EN
TER> NEW <ENTER> BEFORE YOU LOAD
 THIS PROGRAM.
10 CLS:PRINT@107,"THE HEART":PRI
NT@196,"AN EDUCATION PROGRAM BY"
:PRINT"          denis santerre"
20 DIMN$(30),X$(46),Y$(46):GOSUB
1300:GOSUB 1200:PMODE4,1:CLS:PRI
NT"THESE ARE THE WRONG ANSWERS":
SCREEN1,0:COLOR0,1:PCLS
99 '********DRAWS THE MAIN SCREE
NS*****
100 CIRCLE(98,86),70,,1.4,0,.42
110 CIRCLE(45,100),35,,1.2,.27,.
92
120 CIRCLE(128,85),40,,1,.73
130 CIRCLE(98,40),20,,1,.40,.85
140 CIRCLE(98,43),40,,1,.40,.88
150 LINE(4,40)-(4,165),PSET
160 LINE(30,138)-(30,165),PSET
170 LINE(30,62)-(30,40),PSET
180 CIRCLE(17,39),13,,.3
190 CIRCLE(17,164),13,,.3
200 CIRCLE(165,65),12,,1,.6,.8
210 CIRCLE(165,65),20,,1,.6,.8
220 CIRCLE(175,80),12,,1,.6,.8
230 CIRCLE(175,80),20,,1,.65,.8
240 LINE(169,46)-(169,54),PSET
250 LINE(179,70)-(179,60),PSET
260 FORA=1TO4:PCOPYA TOA +8:NEXT
:PMODE4,9:COLOR0,1:CIRCLE(88,84)
,15,,.3:LINE(80,52)-(125,45),PSE
T
270 CIRCLE(98,40),20,,1,.85,.05
280 CIRCLE(98,43),40,,1,.88,.02
290 PMODE4,1:COLOR0,1
300 CIRCLE(150,86),50,,1,.5,.8
310 CIRCLE(150,86),76,,1,.49,.6
320 CIRCLE(150,86),76,,1,.65,.79
330 LINE(103,28)-(82,28),PSET
340 LINE(87,44)-(80,44),PSET
350 LINE(50,28)-(61,28),PSET
360 LINE(50,44)-(57,44),PSET
370 CIRCLE(50,31),3,,2
380 CIRCLE(50,41),3,,2
390 CIRCLE(165,25),7,,2
400 CIRCLE(88,84),13,,1,.5
410 CIRCLE(45,100),30,,1.2,.20,.
07
420 CIRCLE(75,79),10,,1,0,.25
430 CIRCLE(99,80),10,,1,.25,.5
440 CIRCLE(100,90),10,,1,.9,.20
450 CIRCLE(129,80),10,,1,.25,.5
460 CIRCLE(130,90),10,,1,.75
470 CIRCLE(160,90),10,,1,.5,.75
480 CIRCLE(62,138),10,,1,.6,.9
490 CIRCLE(80,116),10,,1,.34,.6
500 LINE(110,170)-(102,84),PSET
510 LINE(98,173)-(99,84),PSET
520 LINE(130,80)-(130,90),PSET
530 LINE(130,80)-(105,65),PSET
```

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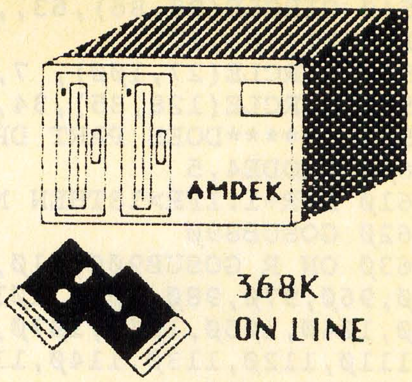

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```
540 CIRCLE(98,86),63,,1.4,0,.42:
PRESET(103,172)
550 CIRCLE(27,100), 7,,3.2
560 CIRCLE(128,85),34,,1,.68
599 '*****DOES PART DRAWING****
600 PMODE4,5
610 R=R+1:IFR>18THEN N=8 ELSEN=0
620 GOSUB890
630 ON R GOSUB900,910,920,940,95
0,960,970,980,1000,1010,1020,103
0,1040,1050,1060,1070,1090,1100,
1110,1120,1130,1140,1150,1170,11
80,990,1190
699 '****DOES THE QUIZZING****
700 A$=N$(R):B=1:PMODE4,5:COLOR0
,1:GOSUB880
710 A=INSTR(A$," "):IFA=0THENA$(
B)=A$:GOTO730
720 A$(B)=LEFT$(A$,A-1):A$=RIGHT
$(A$,LEN(A$)-A):B=B+1:GOTO710
730 FOR A=1TOB:DRAW "BM142,"+STR
$(160+(A*10)):FORC=1TOLEN(A$(A))
:DRAW"BM+2,-3;R2;BM+3,+3":NEXTC:
NEXT
740 D$="":A=0:A$=INKEY$:C$=""
750 A=A+1:D$=D$+A$(A):DRAW "BM14
2,"+STR$(156+A*10)
760 IFC$=""THENGOSUB860
770 A$=INKEY$:IF A$=CHR$(13)THEN
830
780 IFA$=CHR$(8)THEN700
790 IF A$=>"0"AND A$<="Z"THEN GO
SUB 1340:C$=C$+A$
800 IF LEN(C$)=LEN(D$)THEN IFA<B
 THEN750ELSE IF A=B THEN 830
810 IF C$=""THEN760
820 GOTO770
830 T=T+1:DRAW"BM180,135":IF C$=
D$THEN A$="CORRECT":GOSUB1340:CO
=CO+1:GOTO850
840 PRINTN$(R):SCREEN1,0:A$="WRO
NG":GOSUB1340:GOSUB880:FORA=1TOB
:DRAW"BM142,"+STR$(A*10+156):A$=
A$(A):GOSUB1340:NEXTA:GOTO850
850 A$="SCORE ":DRAW"BM180,150":
GOSUB1340:A$=STR$(INT(CO/T*100))
:GOSUB1340:FORA=1TO700:NEXTA:GOT
O600
860 FOR C=1 TO 100:NEXT:PMODE4,N
+1:SCREEN1,0
870 FOR C=1 TO 100:NEXT:PMODE4,5
:SCREEN1,0:COLOR0,1:RETURN
880 LINE(254,190)-(140,158),PRES
ET,BF:LINE-(254,190),PSET,B:RETU
RN
890 PMODE4,5:SCREEN1,0:COLOR0,1:
FORA=1TO4:PCOPYA+N TOA+4:NEXT:RE
TURN
899 '*****STEPS TO DRAW PARTS**
900 PAINT(55,40),0:PAINT(150,20)
,0:RETURN
910 CIRCLE(87,87),10:RETURN
920 PAINT(162,50),0
930 PAINT(167,68),0:RETURN
940 LINE(140,90)-(150,90),PSET:P
AINT(140,70),0:RETURN
950 LINE(140,90)-(150,90),PSET:L
INE(110,90)-(120,86),PSET:PAINT(
140,110),0:RETURN
960 LINE(85,80)-(90,80),PSET:LIN
E(75,125)-(70,132),PSET:PAINT(90
,130),0:RETURN
970 LINE(75,125)-(70,132),PSET:P
AINT(50,130),0:RETURN
980 GOSUB 910:GOTO1040
990 CIRCLE(85,165),10,,1,0,.25:C
IRCLE(125,160),10,,.7,.25,.5:LIN
E(95,165)-(93,110),PSET:LINE-(11
5,160),PSET:CIRCLE(88,110),5,,1,
.75,0:LINE(88,105)-(50,110),PSET
:RETURN
1000 CIRCLE(145,90),10:RETURN
1010 CIRCLE(70,125),10:RETURN
1020 GOSUB1000:GOTO1010
1030 LINE(110,90)-(121,85),PSET:
PAINT(80,50),0:PAINT(110,75),0:R
ETURN
```

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```
1040 CIRCLE(117,90),10:RETURN
1050 PAINT(160,70),0:RETURN
1060 CIRCLE(98,84),63,,1.4,0,.42
:RETURN
1070 CIRCLE(98,88),70,,1.4,0,.42
::A$="NOT A SACK":DRAW"BM170,100
":GOSUB1340:RETURN
1080 LINE(20,100)-(40,100),PSET:
CIRCLE(30,50),1:RETURN
1090 LINE(4,100)-(9,100),PSET:PA
INT(20,50),0:RETURN
1100 LINE(4,100)-(9,100),PSET:PA
INT(20,140),0:RETURN
1110 CIRCLE(40,85),4:RETURN
1120 CIRCLE(50,105),4:RETURN
1130 CIRCLE(98,95),60,,1.2,.1,.4
:DRAW "BM110,171;H6;E10;BM+15,+5
;H3;U5;BM+15,+1;H4;U4;BM80,171;E
6;H10;BM-15,+0;E3;U5;BM-12,+1;E5
;U5":RETURN
1140 CIRCLE(95,80),50,,1.5,.3,.4
:CIRCLE(90,85),30,,1.5,.25,.42:C
IRCLE(70,110),30,,1.5,.25,.42:CI
RCLE(30,75),40,,1.7,.99,.22:CIRC
LE(34,72),40,,1.7,.02,.2:PAINT(7
0,90),0:RETURN
1150 LINE(83,52)-(167,77),PSET:L
INE-(84,58),PSET:LINE-(83,52),PS
ET:DRAW"BM82,132;M+6,-2;BM+6,-2;
M+6,-2;BM+5,-2;M+5,-2;BM+5,-1;M+
5,-2;BM+5,-2;M+5,-5;BM+5,-5;M+5,
-5;BM+5,-5;M+5,-5;BM+5,-5;M+5,-5
;":PAINT(98,58),0:RETURN
1160 CIRCLE(84,104),10:RETURN
1170 CIRCLE(98,88),70,,1.4,0,.42
:A$="THE SACK":DRAW"BM170,100":G
OSUB1340:RETURN
1180 CIRCLE(100,84),20,,1,.75,0:
CIRCLE(100,84),23,,1,.75,0:LINE(
123,84)-(115,150),PSET:LINE-(120
,84),PSET:LINE(100,61)-(85,61),P
SET:LINE-(88,65),PSET:LINE-(100,
65),PSET:PAINT(122,84),0:RETURN
1190 PRINT"SCORE  "INT(CO/T*100)
:END
1199 '*****LOADS WORDS TO ARRAY*
1200 RESTORE:READA$:IF A$<>"NAME
S"THEN1200
1210 A=0
1220 A=A+1:READA$:IFA$<>"END"THE
NN$(A)=A$:GOTO1220
1230 RETURN
1240 DATA NAMES,PULMONARY ARTERY
,PULMONARY VALVE,PULMONARY VEINS
,LEFT ATRIUM,LEFT VENTRICLE,RIGH
T VENTRICLE
1250 DATA RIGHT ATRIUM,SEMILUNAR
 VALVES,MITRAL VALVE,TRICUSPID V
ALVE,ATROVENTRICULAR VALVES,AORT
A
1260 DATA AORTIC VALVE,MYOCARDIU
M,ENDOCARDIUM,EPICARDIUM
1270 DATA SUPERIOR VENA CAVA,INF
ERIOR VENA CAVA,SA NODE,AV NODE,
PURKINJE FIBERS,RIGHT CORONARY,C
IRCUMFLEX ARTERY
1280 DATA PERICARDIUM,ANTERIOR I
NTERVENTRICULAR BRANCH,BUNDLE OF
 HIS,END
1299 '**LOADS LETTER ARRAY***
1300 RESTORE
1310 READA$:IF A$<>"LETTERS"THEN
1310ELSEA=0
1320 A=A+1:READA$,B$:IFA$<>"END"
THENX$(A)=A$:Y$(A)=B$:GOTO1320
1330 RETURN
1340 FOR J=1 TO LEN(A$)
1350 X$=(MID$(A$,J,1))
1360 IF X$=>"-" AND X$<="Z"THEND
RAW Y$(ASC(X$)-44)
1370 IF X$=" "THENDRAW"BM+7,0"
1380 NEXT J:RETURN
1390 DATA LETTERS,-,"BM+2,-3;R2;
BM+3,+3",,"",,"",0,"BM+1,0;H1U4E
1R2F1D4G1L2;BM+6,0",1,"BM+1,0;R1
NR1U6G1;BM+6,+5",2,"NR4U1E1R1E2U
1H1L2G1;BM+7,+5",3,"BM+0,-1;F1R2
```

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```
E1H2E2H1L3;BM+7,6"
1400 DATA 4,"BM+3,0;U2NR1L3U1E3D
3;BM+4,3",5,"BM+0,-1;F1R2E1U2H1L
3U2R4;BM+3,+6",6,"BM+4,-5;H1L2G1
D4F1R2E1U1H1L3;BM+7,+3",7,"U1E4U
1L4;BM+7,+6",8,"BM+1,-0;H1U1E1H1
U1E1R2F1D1G1NL2F1D1G1L2;BM+6,0"
1410 DATA 9,"BM+0,-1;F1R2E1U4H1L
2G1D1F1R2;BM+4,+3",,"",,"",,"",,
"",,"",,"",,""
1420 DATA A,"U4E2F2D2NL4D2;BM+3,
0",B,"U6R3F1D1G1NL3F1D1G1L3;BM+7
,0"
1430 DATA C,"BM+1,-0;H1U4E1R2F1;
BM+0,+4;G1L2;BM+6,0",D,"U6R3F1D4
G1L3;BM+7,0",E,"NR4U3NR2U3R4;BM+
3,+6"
1440 DATA F,"U3NR2U3R4;BM+3,+6",
G,"BM+1,-0;H1U4E1R2F1;BM+0,+2;NL
1D2G1L2;BM+6,0",H,"U3NU3R4NU3D3;
BM+3,0",I,"BM+1,0;R1NR1U6NL1R1;B
M+4,+6"
1450 DATA J,"BM+0,-1;F1R1E1U5NL1
R1;BM+3,6",K,"U3NU3R1NE3F3;BM+3,
0",L,"NU6R4U1;BM+3,+1",M,"U6F2ND
1E2D6;BM+3,0"
1460 DATA N,"U6F1D1F2D1F1NU6;BM+
3,0",O,"BM+1,0;H1U4E1R2F1D4G1L2;
BM+6,0",P,"U6R3F1D1G1L3;BM+7,3"
1470 DATA Q,"BM+1,0;H1U4E1R2F1D3
G1NH1NF1G1L1;BM+6,0",R,"U6R3F1D1
G1L2NL1F3;BM+3,0",S,"BM+0,-1;F1R
2E1U1H1L2H1U1E1R2F1;BM+3,+5"
1480 DATA T,"BM+2,+0;U6NL2R2;BM+
3,+6",U,"BM+0,-1;NU5F1R2E1U5;BM+
3,6",V,"BM+0,-6;D2F1D1F1ND1E1U1E
1U2;BM+3,+6"
1490 DATA W,"NU6E2NU1F2U6;BM+3,6
",X,"U1E4U1;BM-4,0;D1F4D1;BM+3,0
",Y,"BM+0,-6;D2F2ND2E2U2;BM+3,6"
,Z,"NR4U1E4U1L4;BM+7,6"
1500 DATA END,END
```

```
140 ......241
260 .......63
410 .......64
END .......64
```

Listing 2: HELPDRAW

```
10 PMODE4,1
20 CLEAR1000
30 SCREEN1,1:GOSUB 540'the graph
ics will begin at this gosub # e
ven if you do a renum.
40 CLS:PRINT"THIS PROGRAM WILL H
ELP YOU FIND GRAPHIC STATEMENTS.
":PRINT"SEE THE REMARKS LINES.":
PRINT"by denis santerre ":PRINT"
1) CIRCLE":PRINT"2) LINE":PRINT"
3) BOX":PRINT"4) DRAW":INPUTI
50 ON I GOTO60,170,170,280
60 CLS:PRINT"USE THESE:":PRINT"E
xIT":PRINT"sCREEN":PRINT"UP AND
DOWN ARROWS CHANGES STARTOF ARC"
:PRINT"LEFT AND RIGHT ARROWS CHA
NGES   FINISH OF ARC":PRINT"USE
BOTH JOYSICKS":LINEINPUTZ$
70 SCREEN1,1
80 GOSUB180:CIRCLE(V,H),V1,,H1/V
1,S,F
90 GOSUB270:IF I$=CHR$(94)THEN I
F F<.99THEN S1=S+.05 ELSE S1=0
100 IF I$=CHR$(10)THEN IFS<.05 T
HENS1=1ELSES1=S-.01
110 IF I$=CHR$(8)THEN IF F<.99TH
ENF1=F+.05 ELSE F1=0
120 IF I$=CHR$(9)THEN IFF<.05 TH
ENF1=1 ELSEF1=F1-.01
130 IF I$=">"THEN SS=SS+.01 ELSE
IFI$="<"THENSS=SS-.01
140 IF I$="X"THENCLS: PRINT"CIRC
LE("INT(V)","INT(H)"),"INT(V1)",
,"INT(H1*100/V1)/100","S","F:GOT
O530
150 CIRCLE(V,H),V1,0,H1/V1,S,F:S
=S1:F=F1
160 GOTO80
170 CLS:INPUT"USE YOUR JOYSTICKS
, ExIT,sCREEN CLEAR";Z$:SCREEN1,
1:ONI-1GOTO190,230
180 GOSUB260:V1=V1*254/63+1:H1=H
1*190/63+1:RETURN
190 GOSUB 180:LINE(V,H)-(V1,H1),
PSET
200 GOSUB 270:IF I$="X"THEN CLS:
PRINT"LINE("INT(V)","INT(H)")-("
INT(V1)","INT(H1)"),PSET":GOTO53
0
210 LINE(V,H)-(V1,H1),PRESET
220 GOTO190
230 GOSUB 180:LINE(V,H)-(V1,H1),
PSET,B
240 GOSUB 270:IF I$="X"THEN CLS:
PRINT"LINE("INT(V)","INT(H)")-("
INT(V1)","INT(H1)"),PSET,B":GOTO
530
250 LINE(V,H)-(V1,H1),PRESET,B:G
OTO230
260 V=JOYSTK(0)*250/64:H=JOYSTK(
1)*190/63:V1=JOYSTK(2):H1=JOYSTK
(3):RETURN
270 I$=INKEY$:IF I$="S"THENGOTO5
40ELSERETURN
280 CLS:PRINT"THESE ARE YOUR COM
MANDS YOU WILLHAVE TO REMEMBER."
:PRINT"uP, dOWN, lEFT, rIGHT, mO
```

```
VE, nO UPDATE bLANK MOVE":PRINT"
e,h,g,f-FOR 45,135,225,315
DEGREES":PRINT"oK, cANCEL, ExIT,
 iNSTRUCTIONS":PRINT"sCREEN UPDA
TE"
290 PRINT"THE LEFT AND RIGHT ARR
OWS WILL  CHANGE DISTANCE"
300 PRINT"USE YOUR RIGHT JOYSTIC
K AND      <ENTER> FOR MOVE"
310 INPUT"PRESS ENTER TO CONTINU
E";I$
320 IFA$=""THENA$="BM127,95"
330 SCREEN1,1
340 GOSUB 270
350 DRAWA$
360 IFLEN(A$)>240 THENGOTO520
370 IF I$=""THENGOTO340
380 IF I$="N"THEN N$="N":GOTO340
390 IF I$="B"THENN$="B":I$="M"
400 ON INSTR("MUDLREFGHXI",I$)+1
 GOTO 340,440,450,450,450,450,45
0,450,450,450,520,280
410 SCREEN1,1:DRAW A$+B$
420 K$=INKEY$:IFK$=""THEN420 ELS
E IFK$="O"THENA$=A$+N$+B$:N$="":
GOTO340ELSE DRAW"C0"+A$+B$:DRAW"
C1"+A$:IFK$="C"THENN$="":GOTO340
:ELSE GOTO400
430 RETURN
440 GOSUB 460:GOTO410
450 GOSUB 470:GOTO410
460 GOSUB260:X$=STR$(INT(V)):Y$=
STR$(INT(H)):B$=I$+X$+","+Y$:RET
URN
470 GOSUB490:X$=STR$(D)
480 B$=I$+X$:RETURN
490 IF K$=CHR$(9)THEND=D+5ELSE I
FK$=CHR$(8)THEND=D-1
500 IF D<1THEND=1ELSEIF D>254THE
ND=254
510 RETURN
520 CLS:PRINTA$
530 PRINT"..... IS THE GRAPHIC S
TATEMENT  TO ADD TO YOU PROGRAM.
":PRINT"YOU MAY OMIT SPACES.":EN
D
540 PCLS:SCREEN1,1'***THIS AREA
IS FOR ROUTINES AS YOU WRITE THE
M********
1000 RETURN
```

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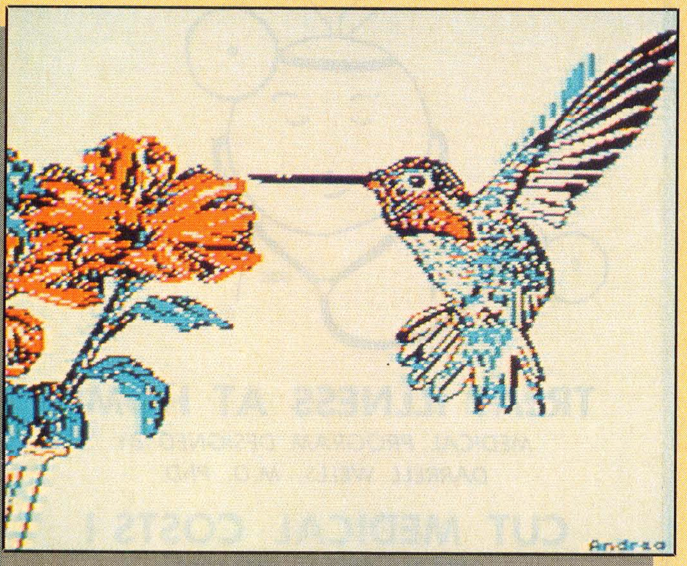

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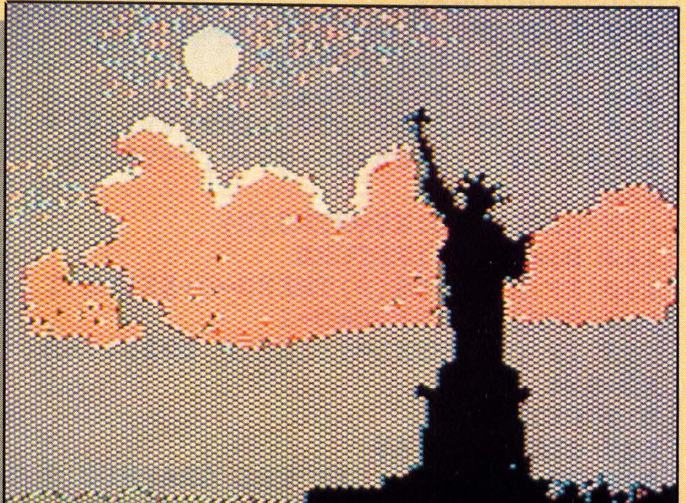
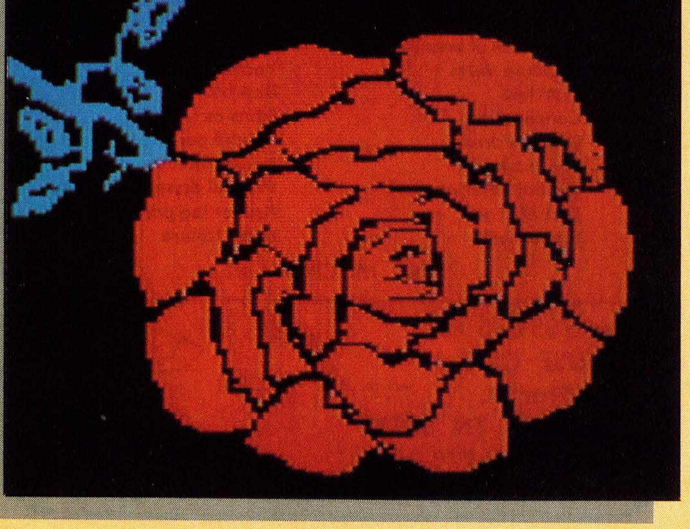
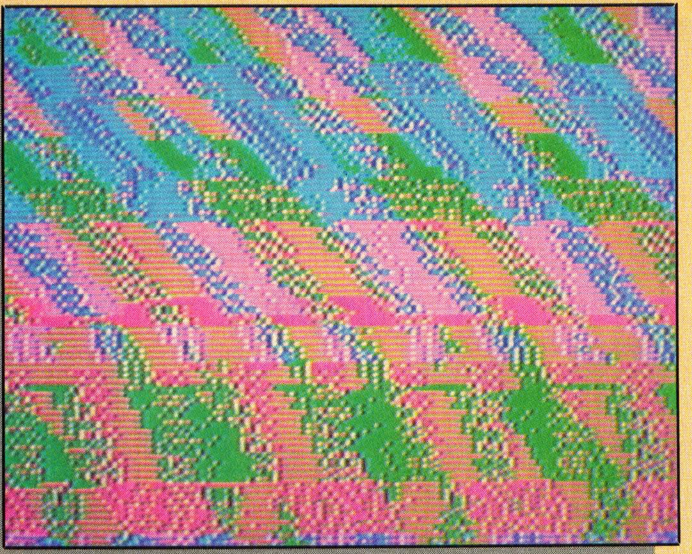




3rd PRIZE

James C. Graves, Jr.
Rose
Poets have long waxed lyrical over the rose, but James shows us once again why pictures are worth a thousand words. James lives in Sierra Vista, Ariz.

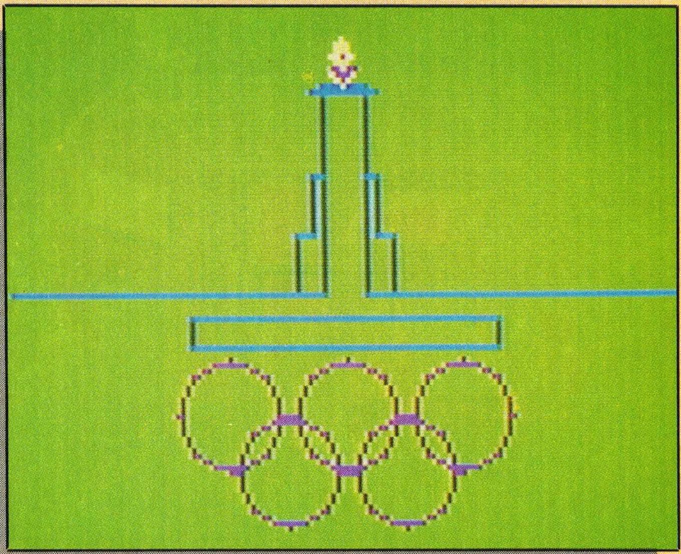


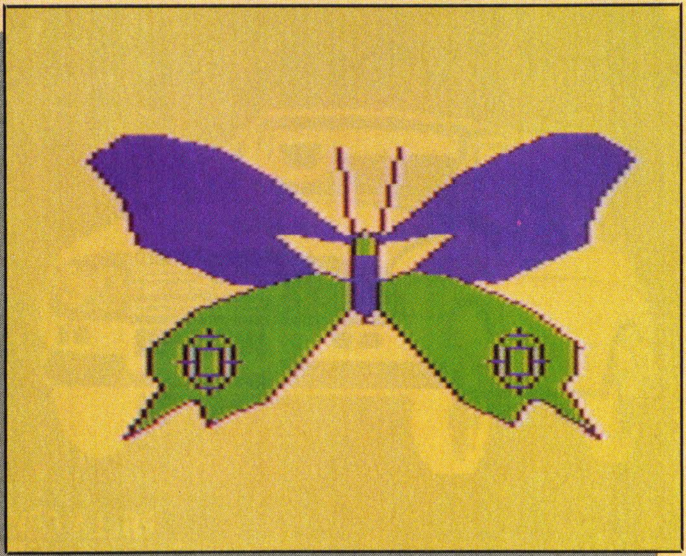
HONORABLE MENTION

Michael E. Murray
Abstract
Michael lives in Venice, Calif., and sends us this graphics image produced from his own program for converting sound into digital data.

HONORABLE MENTION

Don Duquet
Olympic Rings
Don drew this tribute to the 1984 Olympic Games in Los Angeles with the aid of a BASIC program he wrote. Don lives in Winslow, Maine.



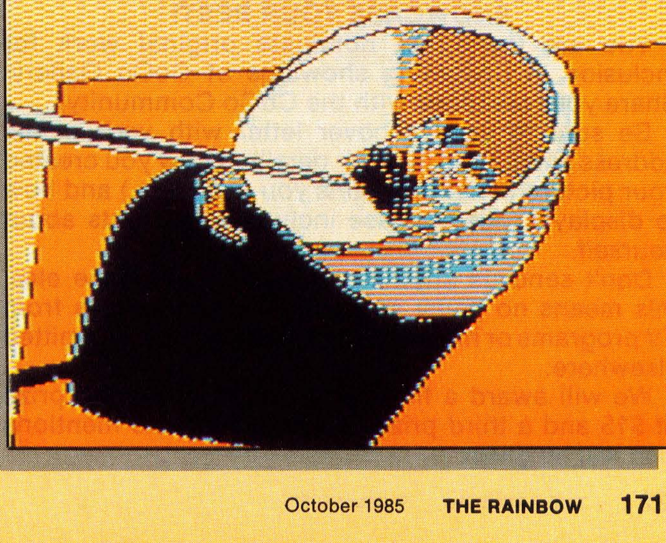


HONORABLE MENTION

Merwyn Bly
Butterfly
From Vienna, Va., Merwyn gives the Gallery a butterfly drawn using BASIC LINE commands, which produce the curves we see in the upper wings.

HONORABLE MENTION

Maureen Iverson
English Breakfast
Maureen is an art student and sends THE RAINBOW this cheery still life. Maureen lives in St. Croix, Wis.

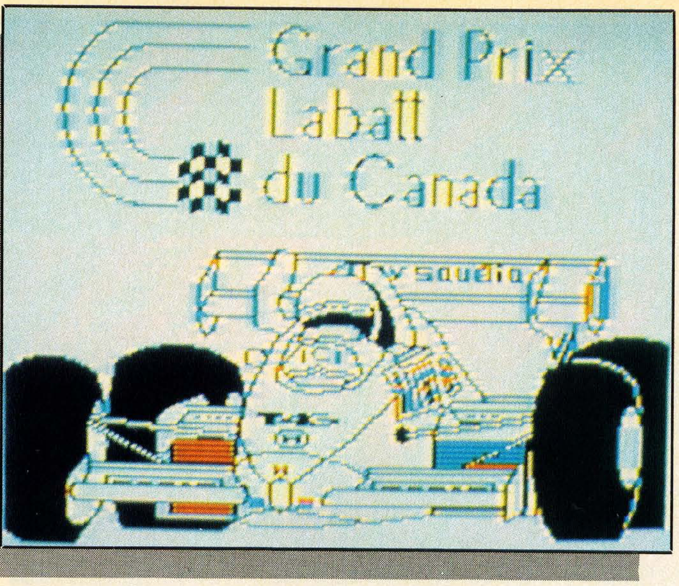


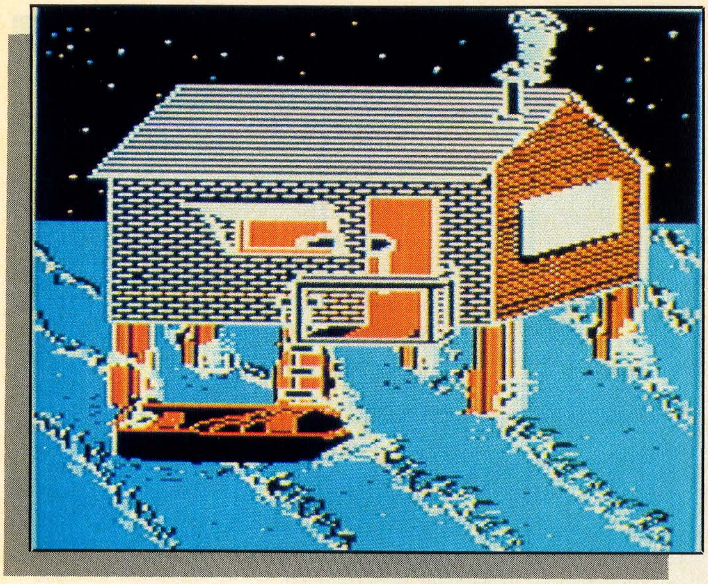
HONORABLE MENTION

Nicolas Cote

Grand Prix

Nicolas lives in Alma, Quebec, and gives the Gallery another international racer's delight.





HONORABLE MENTION

Steven Baker

Flood

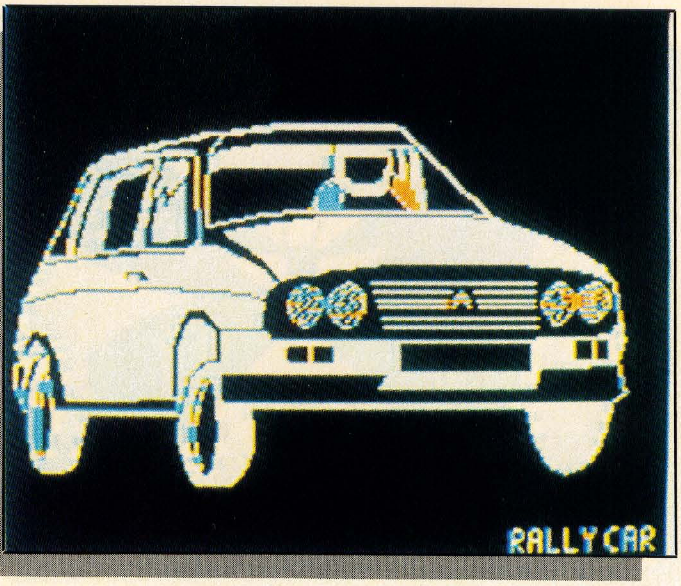
Steven really gripped us with this dramatic depiction of a benighted house during a flood. Steven lives in Hattiesburg, Miss.

HONORABLE MENTION

Patrick Van Driel

Rally Car

This month, we go international with Patrick's portrait of a French Citroen Visa. Patrick lives in Hellvoetsluis, Holland.



SHOWCASE YOUR BEST!

You are invited to nominate original work for inclusion in upcoming showings of CoCo Gallery. Share your creations with the CoCo Community!

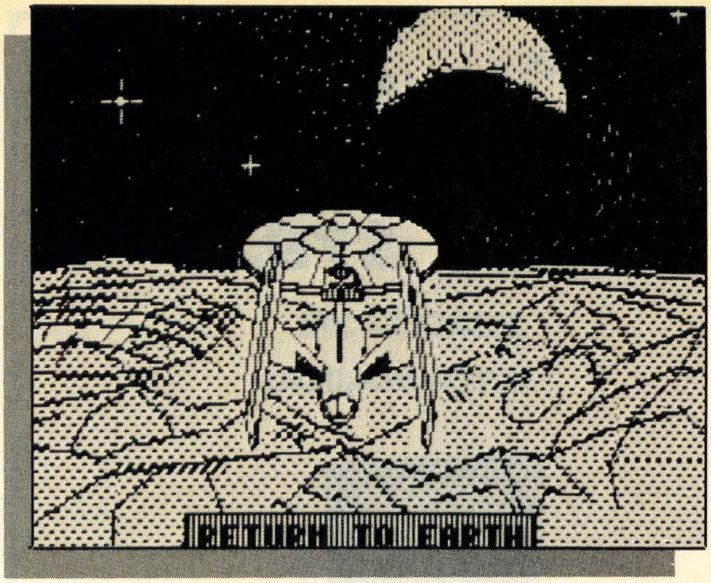
Be sure to send a cover letter with your name, address and phone number detailing how you created your picture (what programs you used, etc.) and how to display it. Also, please include a few facts about yourself.

Don't send us anything owned by someone else; this means no game screens, digitized images from TV programs or material that's already been submitted elsewhere.

We will award a first prize of $25, a second prize of $15 and a third prize of $10. Honorable mentions also will be given.

Send your entry on either tape or disk to:

CoCo Gallery
THE RAINBOW
P.O. Box 385
Prospect, KY 40059
Attn: Monica Dorth

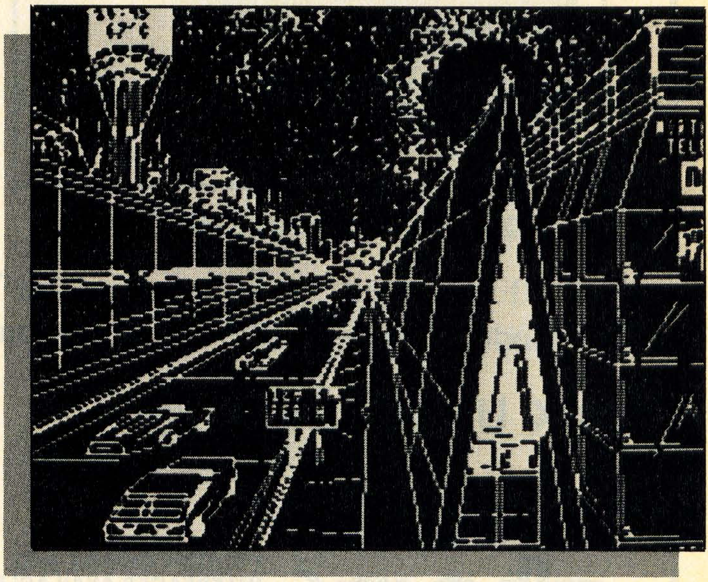


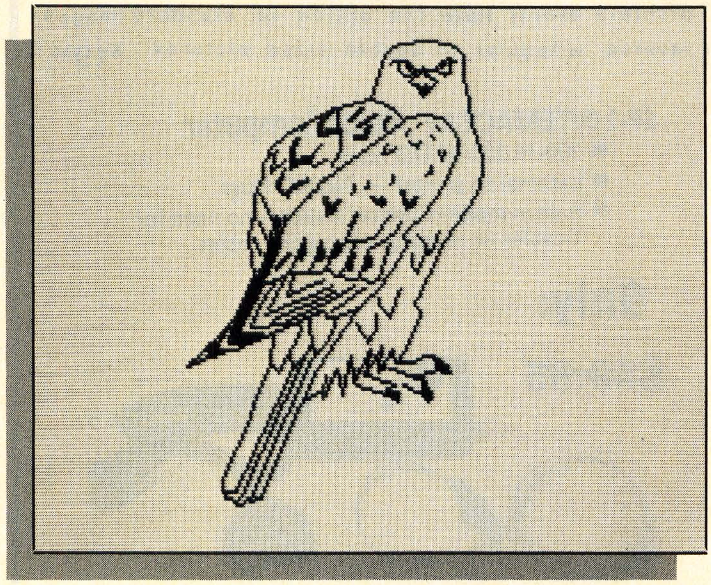
HONORABLE MENTION

Brian S. Thorn
U.S.S. Enterprise
Brian has created a stirring illustration of The Federation's most famous ship approaching Earth. Brian lives on Patrick Air Force Base, Fla.

HONORABLE MENTION

Ray Larabie
Street Scene
Ray lives in White Lake, Ontario, and offers this impressive display of perspectives in a contemporary setting.



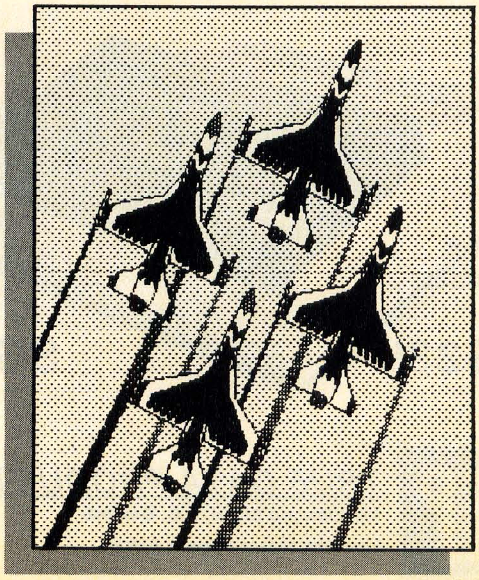


HONORABLE MENTION

Michael Keefe
Gyrfalco
From Philadelphia, Pa., Michael has submitted a portrait of a gyrfalcon, a strong and fierce predator of great dignity.

HONORABLE MENTION

Clay Howe
USAF Thunderbirds
Clay lives in Sturgis, Mich., and has captured the "right stuff" of the Thunderbirds' straight up, diamond formation.



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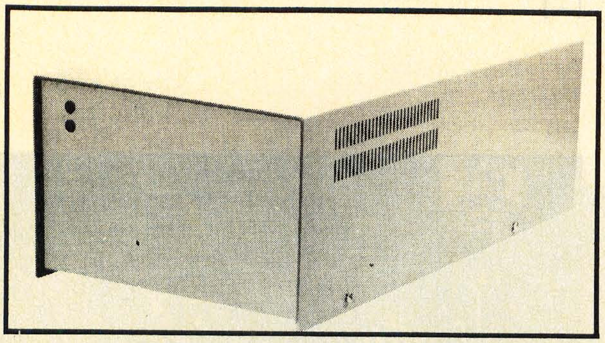

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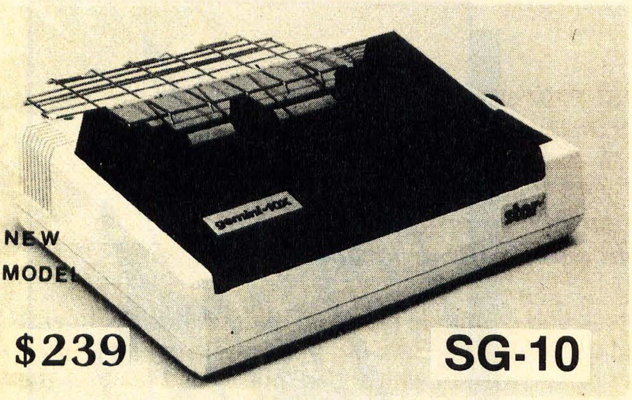

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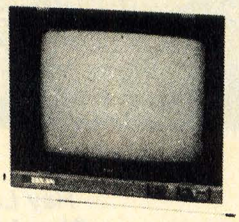

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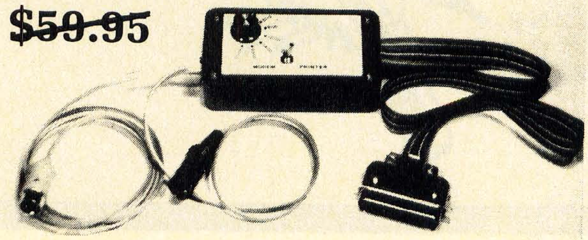

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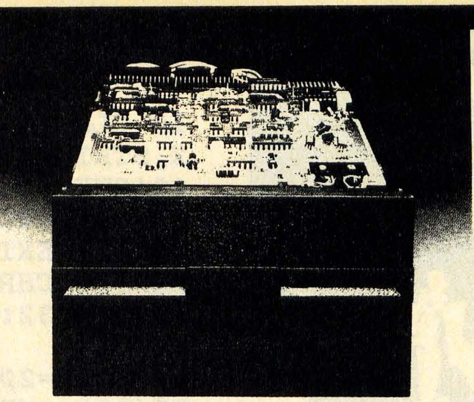

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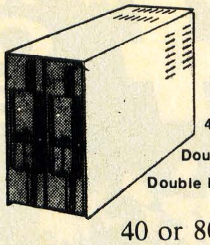

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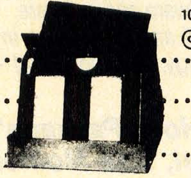

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Important Message

16K ECB

By Bill Bernico

```
10 CLS:FORX=96TO448STEP96:PRINT@
X,STRING$(32,45);:NEXTX:FORY=4TO
484STEP32:PRINT@Y,CHR$(33);:NEXT
Y:FORZ=8TO488STEP32:PRINT@Z,CHR$
(33);:NEXTZ:FORC=12TO492STEP32:P
RINT@C,CHR$(33);:NEXTC:FORV=16TO
496STEP32:PRINT@V,CHR$(33);:NEXT
V
20 FORB=20TO500STEP32:PRINT@B,CH
R$(33);:NEXTB:FORN=24TO504STEP32
:PRINT@N,CHR$(33);:NEXTN:FORM=28
TO508STEP32:PRINT@M,CHR$(33);:NE
XTM:FORF=96TO384STEP96:PRINT@F,"
    ";:NEXTF
30 POKE1058,15:POKE1090,3:POKE11
22,20:POKE1154,15:POKE1186,2:POK
E1218,5:POKE1250,18:POKE1314,113
:POKE1346,121:POKE1378,120:POKE1
410,117
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1526,5:POKE1527,20:POKE1528,15:P
OKE1529,14
80 FORU=1TO1000:POKE1177,49:POKE
1178,49:POKE1181,49:POKE1182,50:
POKE1253,49:POKE1254,51:FORX=1TO
600:NEXTX:POKE1177,113:POKE1178,
113:POKE1181,113:POKE1182,114:PO
KE1253,113:POKE1254,115:FORB=1TO
600:NEXTB,U
```

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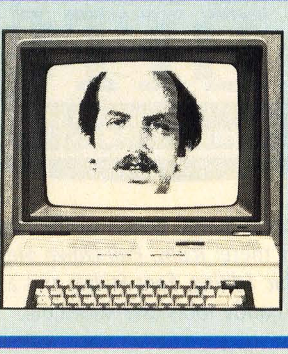

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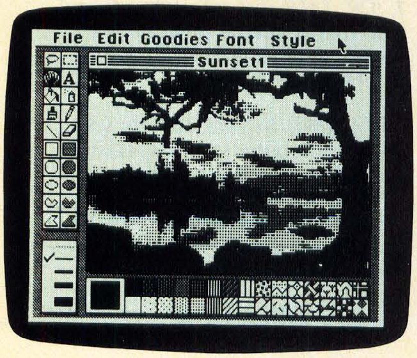
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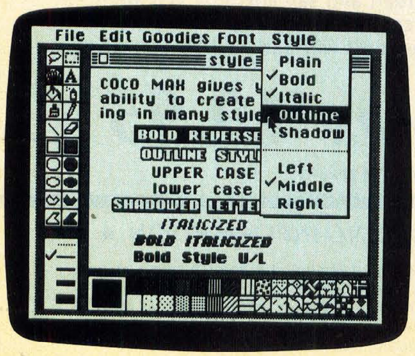
We are all witnessing an exciting revolution in microcomputers: a radically new kind of computer and software that opens a whole new world of creative power to computer users.

It was inevitable that this exciting approach would be brought to the CoCo. With this in mind, Colorware chose to go all out and maximize this new concept for the color computer. That meant designing not just software but hardware too. It meant thousands of hours of pure machine language programming. Rarely has this much effort been applied to one product for the Color Computer.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style
Plain
✓Bold
✓Italic
Outline
Shadow
Left
✓Middle
Right
COCO MAX gives y
ability to create
ing in many style
BOLD REVERSE
OUTLINE STYL
UPPER CASE
lower case
SHADOWED LETTER
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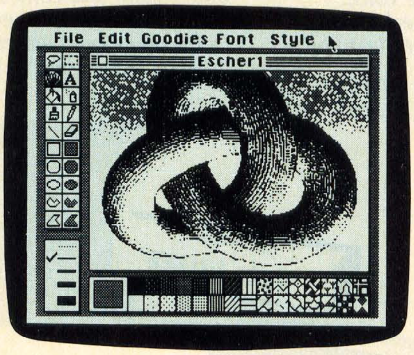
Bold Style U/L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Escher1

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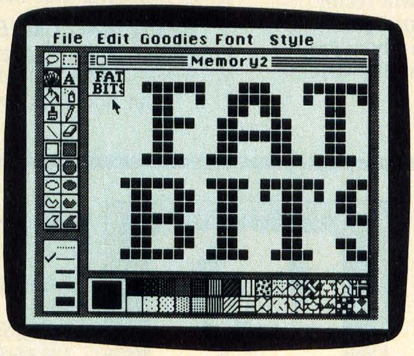
Because we took the maximum approach: highly optimized machine code combined with hardware, CoCo Max truly stands above the rest as the ultimate creative tool for the Color Computer. It's unrivaled performance lets you create with more brilliance and more speed than any similar system – much more than you ever imagined possible. And, you can do it in black & white or color.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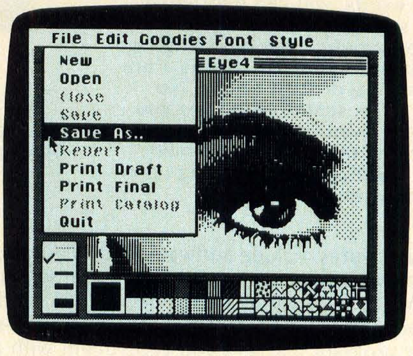
Memory2
FAT BITS
FAT
BITS

All the sophisticated power of the bigger systems is there: *Icons, Pull-Down Menus,* full *Graphic Editing, Font Styles,* and all kinds of handy tools and shortcuts.

Plug your joystick, mouse or touch pad into CoCo Max's Hi-Res Input Unit. Then use a delightfully simple *Point-and-Click* method to get any of CoCo Max's powerful graphic tools. It has them all:

You can *Brush, Spray* or *Fill* with any *Color, Shading* or *Pattern.* Use *Rubber Band Lines* and *Shapes* (square, rectangle, circle, elipse, etc.) to create perfect illustriations with speed and ease. There's a *Pencil,* an *Eraser* and even a selection of *Caligraphy Brushes.* And, as you can see, CoCo Max can do a lot with text. All of the newest special effects are there: *Trace Edges, Flip, Invert, Brush Mirrors,* etc. And all of the very latest super-capabilities like: *Undo,* which automatically reverses your mistakes, and *Fat Bits* which zooms you way in on any part of your subject to allow dot-for-dot precision.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Eye4
New
Open
Close
Save
Save As..
Revert
Print Draft
Print Final
Print Catalog
Quit

THE BIG PICTURE

The large image box in the middle of the CoCo Max screen is actually only a window on an even larger image. Use the Point-and Click "Hand" to effortlessly move your window over any portion of the larger image. You have a working area of up to 3-½ times the area of the window itself.

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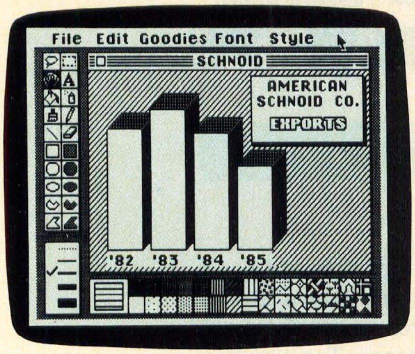
CoCo Max gives you many ways to print. Fill a whole page with your image or condense two full CoCo screens to less than ¼ page for a finely detailed copy. "Dump" your CoCo Max screen full size or shrink it to ⅛ page size.

THE COCO MAX SYSTEM

FREEDOM TO CREATE...

Anyone who wants to create anything at all on their CoCo screen or printer will certainly be very glad to meet CoCo Max. CoCo Max's friendly yet sophisticated graphic and text capabilities let you almost instantly produce illustrations, diagrams, charts,



graphs, and computer art – for serious use or just for creative fun.

AN ABSOLUTE GUARANTEE

CoCo Max is a hardware/software system that no software-only system can match. Get CoCo Max and see your CoCo perform as it never could before. If you don't agree that CoCo Max is the ultimate creative tool for the Color Computer, simply return it within 20 days for a full, courteous refund from Colorware.

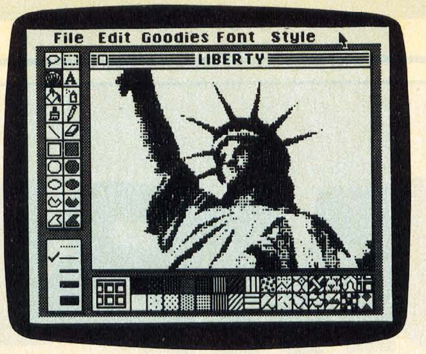
THE HARDWARE...

This is the key to CoCo Max's unmatched performance. Did you know the normal joystick input built into the Color Computer only allows access to 4,096 (64 x 64) points on the CoCo screen? Yet, the Color Computer's high resolution screen

COCO MAX
Hi-Res Input Unit

has 49,152 (256 x 192) pixels. This means that a joystick, mouse or even a touch pad can, at best, only access about one tenth of the pixels on the CoCo screen.

Most graphic programs ignore this hardware limitation of the Color Computer and give you only low-res control. Others attempt to overcome the limita-



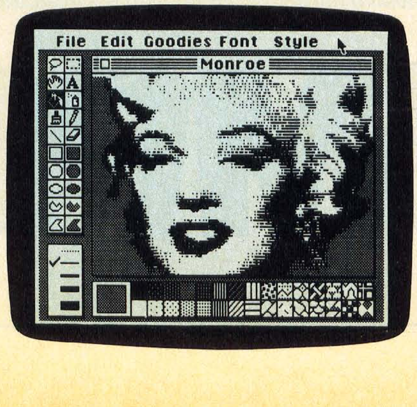
tion by using software schemes such as sliding windows. Although clever, these schemes yield sluggish and awkward results. Only CoCo Max does it the right way. The CoCo Max Hi-Res Input Unit plugs into your ROM slot and adds an entirely new joystick input to your computer – a precision one with a 49,152 point resolution to match the CoCo screen exactly.

Plug your same joystick, mouse or touch pad into this new input and you have a whole new kind of control. The difference is remarkable.

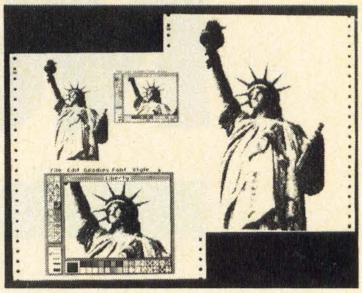
COCO MAX
CoCo Max

A DIGITIZER OPTION...

We studied all the video digitizers available and picked the best of them to link with CoCo Max. The DS-69 from Micro Works was our choice. This optional device lets you capture the image from any video source (video recorder, camera, etc.) on your Color Computer.



You may then use CoCo Max's graphic magic on it. The DS-69 is available as an option from Colorware from $149.95 complete with its own software on disk or tape. Using the DS-69 with a disk requires an RS multi-pak adaptor.


File Edit Goodies Font Style

COCO MAX REQUIREMENTS

The CoCo Max System includes the Hi-Res Input Unit, software on disk or cassette (please specify) and user manual. It will work on any 64K Extended or non-extended Color Computer. You'll need a Radio Shack or equivalent joystick, mouse or touch pad. Disk systems require a Multi-Slot Interface or Y-Branching Cable.

THE COMPLETE COCO MAX SYSTEM, with software on *DISK*. *$69.95*

with software on *CASSETTE* (Available Mar '85). *$69.95*

Y-BRANCHING CABLE-If you have a disk system but do not have a Multi-Slot Interface, use this economical 40-pin, 1 male, 2 female cable to connect the CoCo Max Hi-Res input unit and your disk controller to your CoCo. *$27.95*

Sorry, COCO MAX is not compatible with JDOS

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NUMBER BUMPER

For a challenge of your wits, try this mental stumper

By Richard Ramella

An arcade game calling more for mental than physical reaction, *Number Bumper* works in Color BASIC and — with the change noted in Line 150 — on the MC-10.

I've corresponded with hundreds of Color Computer owners, and while we all share one interest — the CoCo — we are a community of differing physical abilities. I know of a recovering stroke victim who uses two fingers of the same hand to type the BASIC listings found in THE RAINBOW. And there are users with degrees of impaired movement or paralysis caused by a range of circumstances.

Number Bumper is a game that such users can play. It is not meant to condescend to anyone's physical disability, but rather to equalize play among the range of our CoCo family by making the gist of the game a mental decision triggered by the tap of any key. I think *Number Bumper* will be challenging to all who enjoy recreations calling for nimble wits.

(Richard Ramella is a former newspaper editor who now works as a writer for a California hospital. He has published more than 200 Color Computer programs.)

To start the game, type RUN and press ENTER. Orange bars are drawn at top and bottom of the screen, with the word "SCORE:" at the bottom. Tap any key to start the game. As play begins, a number ranging from zero to nine scoots across the top of the bottom orange bar. Pressing any key shoots it to the top of the screen. It rests where it hits.

If a number is allowed to scoot all the way across the screen, 10 points are deducted. Points are scored by shooting a number up to rest against a higher number. For example, a '9' has stuck against the top bar; a '1' comes scooting across. A key tap sends the '1' upward to stick against the '9'. Since 9 - 1 = 8, the turn is worth eight points. There is no score if the top number is lower than the number that hits it.

The game ends if two of the same number end up touching, either side by side or top to bottom. This produces a razzing sound, after which another game may be started by tapping any key twice.

(For those having any questions about this program, Mr. Ramella can be contacted at 1493 Mt. View Avenue, Chico, CA 95926. Please include an SASE.) □

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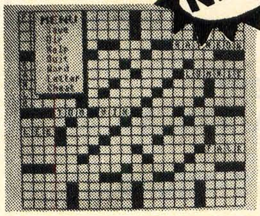

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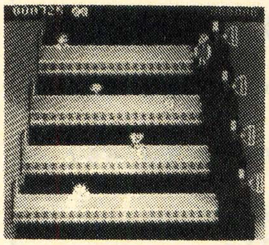

Move along the end of the bars serving beer to your thirsty customers. Watch for falling glasses and rowdy customers. Loads of fun.

REQUIRES 32K & JOYSTICK
TAPE $14.95
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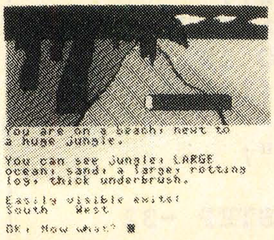

```
You are on a beach; next to
a huge jungle.

You can see jungle; LARGE
ocean; sand; a large; rotting
log; thick underbrush.

Easily visible exits:
South   West

OK, Now what? █
```

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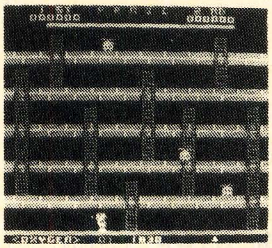

Climb the ladders and fight the "meanies". Dig holes and bury them. Hours of fun await you in this outstanding graphic arcade game. Enjoyment for all ages.

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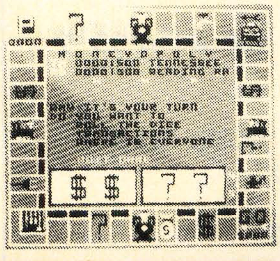

Now! Play this popular board game on your computer. Probably the most realistic computer board game simulation ever. Contains all the features of the original. Buy, rent or sell properties and become a wealthy land baron with this program.

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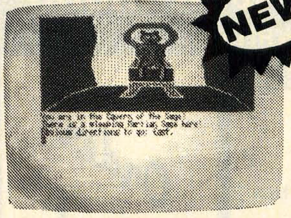
NEW!

THE MARTIAN CRYPT



All new graphic adventure — Man discovers that life once existed on Mars. Can you find the hidden Martian Crypt? With sound effects to over 30 screens of animated high res graphics.

REQUIRES 32K MACHINE
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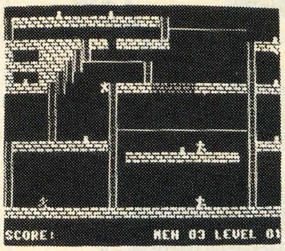

Travel the maze, in your never ending search for **GOLD.** But be careful! There are hidden trap doors, burly guards, tricky ladders & slippery ropes. Sounds easy you say? Clear the 1st screen and 32 more await you!

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JOYSTICK OR KEYBOARD
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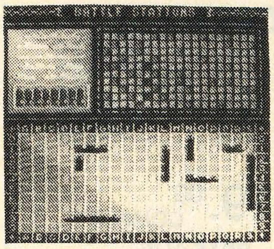
BATTLE STATIONS



BATTLE STATIONS is a remake of a popular board game. Without a doubt the most outstanding sound and graphics you have ever heard or seen. **BATTLE STATIONS** is a one player interactive simulation of skill, strategy and luck. The player pits his tactical skills against the cold, cunning logic of the computer.

REQUIRES 32K DISK
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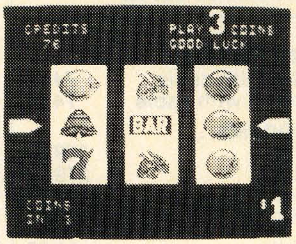
VEGAS GAME PAK



Have you ever wanted to bring Las Vegas home with you? Now you can! Six different games in this package: Blackjack, Keno, Poker, plus three other slot machine lookalikes. The only thing missing is the voice of Wayne Newton!

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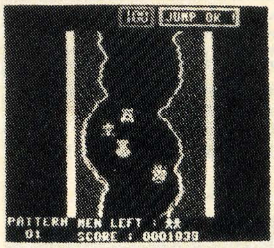

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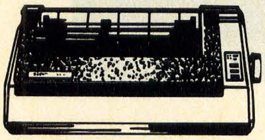

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300 239
END 12

The listing: NMBRBMPR

```
100 REM * NUMBER BUMPER * TRS-80
 COLOR BASIC 16K
110 REM * BY RICHARD RAMELLA
120 CLS0: FOR X=1 TO 18: Q$=Q$+C
HR$(128): NEXT
130 Z$=CHR$(255): FOR X=1 TO 5:
Z$=Z$+Z$: NEXT
140 S$="0123456789"
150 PK=1024: REM * MC-10 MAKE TH
IS PK=16384
160 PRINT Z$;
170 PRINT @ 448,Z$;
180 PRINT @ 488,"SCORE:";
190 PRINT @ 232,"TAP A KEY TO ST
ART";
200 IF INKEY$="" THEN Z=RND(0):
GOTO 200
210 PRINT @ 232,Q$;
220 N$=MID$(S$,RND(10),1)
230 X=RND(2)
240 IF X=1 THEN FOR L=447 TO 416
 STEP -1
250 IF X=2 THEN FOR L=416 TO 447
260 PRINT @ L,N$;
270 FOR T=1 TO 40: NEXT T
280 PRINT @ L,CHR$(128);
290 A$=INKEY$: IF A$<>""THEN 350
300 NEXT L: FOR X=1 TO 10
310 SOUND RND(13)*RND(13),1
320 NEXT X: SC=SC-10
330 PRINT @ 494,SC;" ";
340 GOTO 220
350 FOR L=L TO L-384 STEP -32
360 PRINT @ L,N$;
370 L1=PEEK(PK+L-1)
380 R1=PEEK(PK+L+1)
390 U1=PEEK(PK+L-32)
400 IF U1<>128 THEN 430
410 PRINT @ L,CHR$(128);
420 NEXT L: GOTO 220
430 P=PEEK(PK+L)
440 IF L1=P OR R1=P OR U1=P THEN
 480
450 S1=U1-P: IF S1<0 OR U1=255 T
HEN 220
460 SC=SC+S1
470 PRINT @ 494,SC;: GOTO 220
480 PRINT @ 14,"END";
490 FOR T=1 TO 30
500 SOUND 100,1: NEXT
510 PRINT @ 448,"";
520 Z$=INKEY$: IF Z$="" THEN 520
530 GOTO 120
540 END
```

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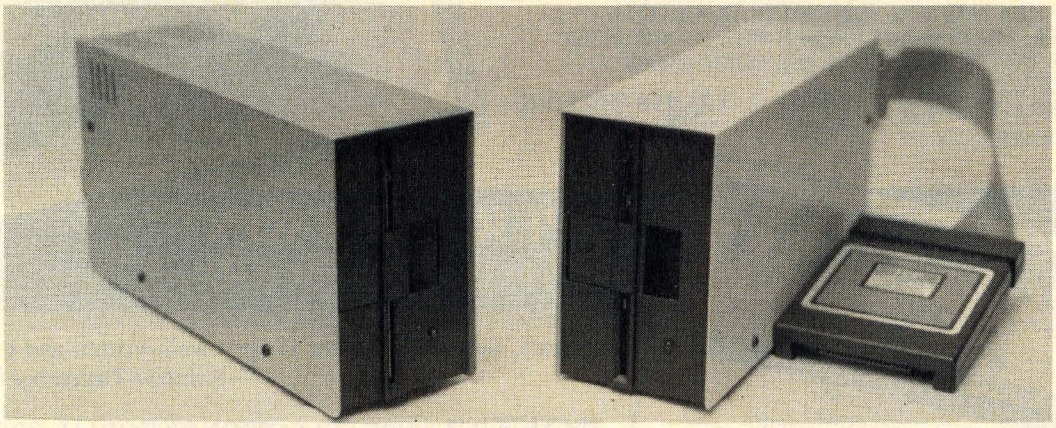

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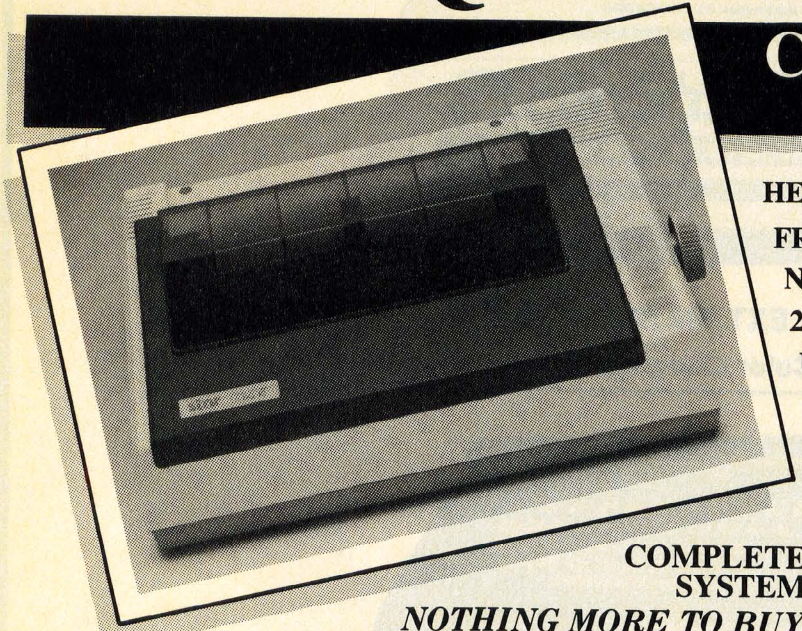

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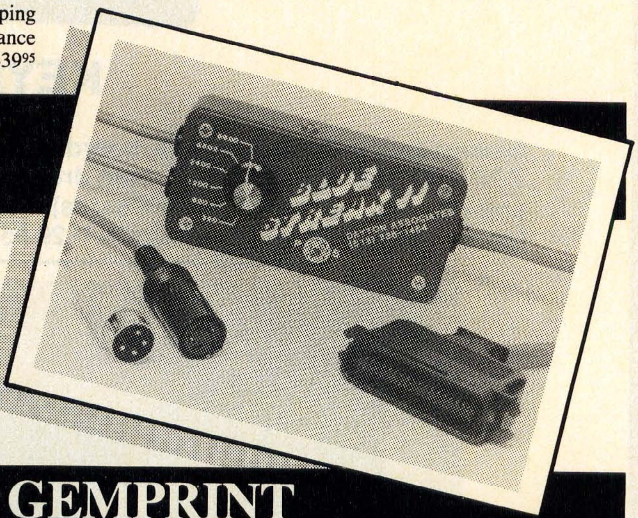

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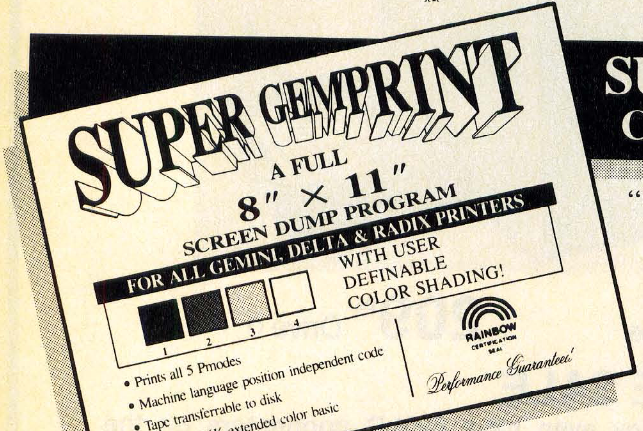

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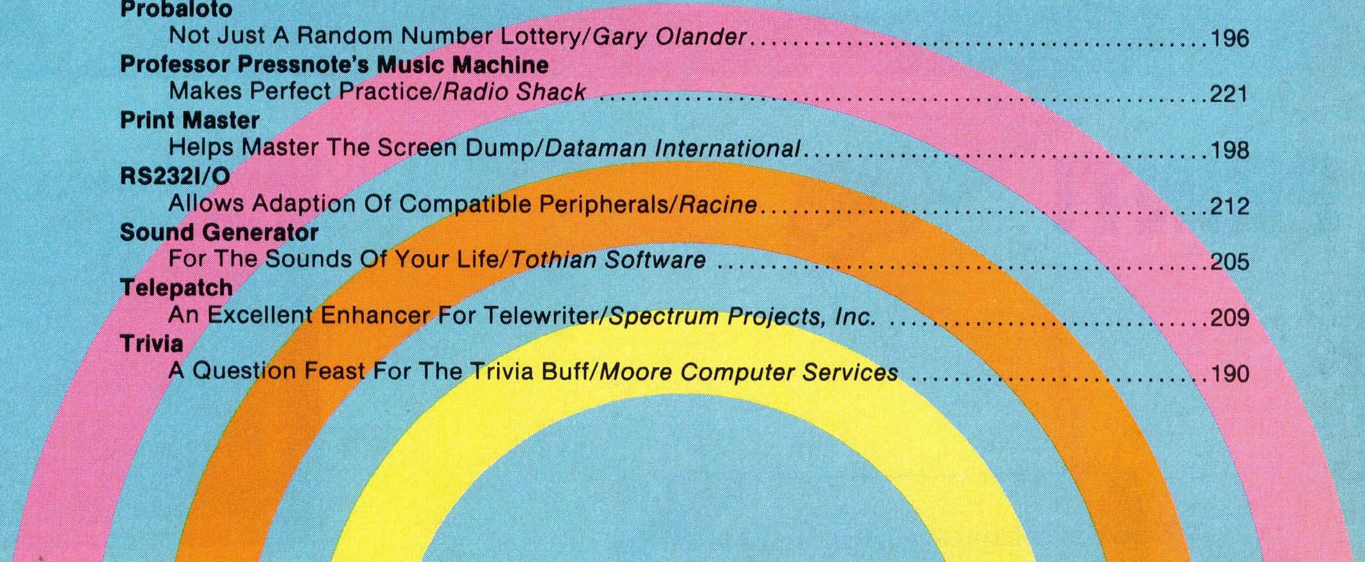

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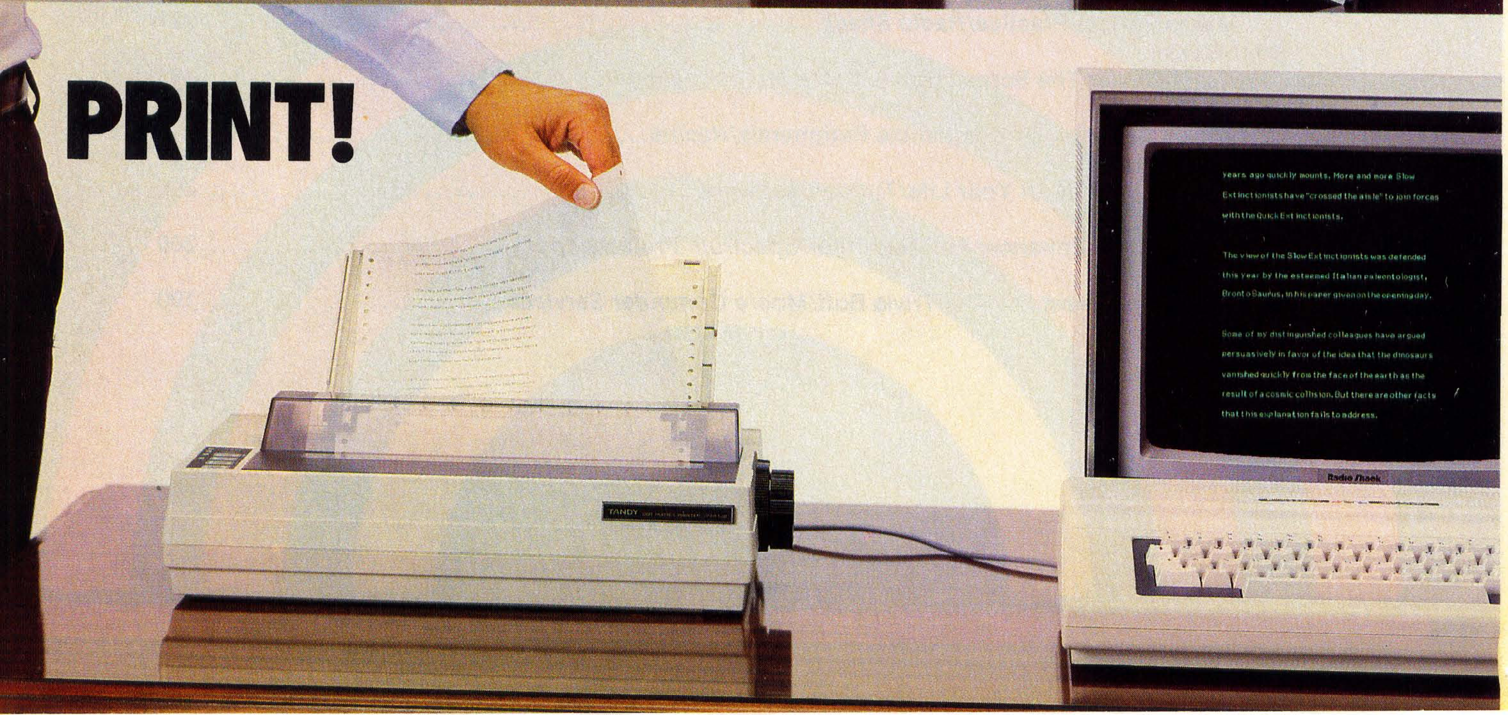
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```
years ago quickly mounts. More and more Slow
Extinctionists have "crossed the aisle" to join forces
with the Quick Extinctionists.

The view of the Slow Extinctionists was defended
this year by the esteemed Italian paleontologist,
Bronto Saurus, in his paper given on the opening day.

Some of my distinguished colleagues have argued
persuasively in favor of the idea that the dinosaurs
vanished quickly from the face of the earth as the
result of a cosmic collision. But there are other facts
that this explanation fails to address.
```

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DMP 105

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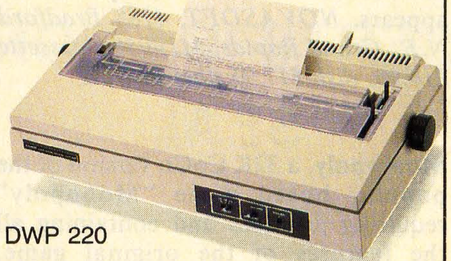
There are several reasons why dot-matrix printers are more commonly used with personal computers than any other type of printer. One is price. If you are looking for an affordable printer, you'll find our DMP 105 is ideal. For under $200, this bi-directional dot-matrix printer will fulfill your data processing and general purpose uses. Another reason dot-matrix printers are so popular is speed. Our DMP 105 produces 80 upper and lower case characters per line at 43 lines per minute (80 cps). But the most important reason is performance. With bit-image graphics mode, removable adjustable tractor, our DMP 105 is hard to beat! (#26-1276, $199.95.)

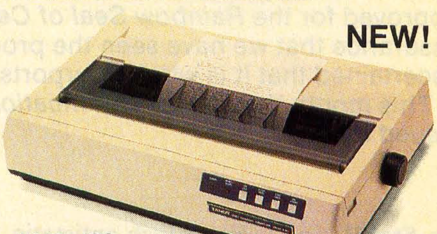


DWP 220

Our Lowest-Priced Daisy Wheel Printer

How good do the printouts you produce have to look? If you are producing business letters or important reports, you know it's essential to get clean, sharp characters. With our DWP 220 you'll get full-featured letter-perfect printing for under $600. Crisp, electric typewriter-quality characters are printed at over 200 words per minute (20 cps). Also includes forward and reverse paper feed and 1/2-line feed, underline and programmable backspace. (#26-1278, $599.)

NEW!



DMP 430

132-Column Printer with 18-Wire Print Head

Never before has such fine print quality been so affordable! The print head of our DMP 430 contains 18 wires to produce excellent correspondence-quality fonts in a single pass. Prints 10, 12 or 16.7 characters per inch, plus elongated standard, elite and condensed at up to 180 characters per second. You can choose from micro, italic and double-high fonts, too. Produces bit-image graphics at 7 or 16-dot columns. The DMP 430 features a true pin-driven tractor—not sprocket, and is compatible with the IBM® PC. (#26-1277, $899.)

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Come to your local Radio Shack Computer Center today for the best selection in high-performance printers, as well as cables and accessories. Each of these printers feature both parallel and Color Computer-compatible serial interfaces so you can use them with any of our computers for "no-surprises" printing.

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RECEIVED & CERTIFIED

The following products recently have been received by THE RAINBOW, examined by our magazine staff and approved for the *Rainbow Seal of Certification*, your assurance that we have seen the product and have ascertained that it is what it purports to be.

This month the *Seal of Certification* has been issued to:

No-Stat II, an 11- by 15-inch antistatic pad to rest CoCo on, protect it from static electricity and draw dust and lint away from sensitive chips. The pad is made of inert conductive foam, laminated to a tufted fabric and contains no sprays or chemicals. *Amber Enterprises, P.O. Box 7439, Greenville, SC 29610, $5.95*

Escape From Denna, a 32K ECB graphics Adventure set in the medieval Castle of Denna. The Adventurer is challenged to escape the dark, damp and stinking dungeon of the Castle Denna armed with nothing more than good sense and survival skills. *Ark Royal Games, P.O. Box 14806, Jacksonville, FL 32238, cassette $25.95, disk $28.95*

Island Adventure, a 32/64K graphics oriented Adventure game requiring a disk drive. The scenario: your private aircraft crash-lands on a remote Atlantic island. You awaken uninjured to find your demolished plane missing its radio. Did it fall into the ocean? Did someone take it during your unconsciousness? Is the island, therefore, inhabited? Where are you? How do you get off this island? *Stephen B. Boothby, 435 Dorset Commons #93, So. Burlington, VT 05401, two disks $11.95 plus $2 S/H*

Battle Stations, a 32/64K one-player interactive game to test skill and strategy. CoCo is your adversary as you face off in this game of tactics. *NOVASOFT, 4285 Bradford N.E., Grand Rapids, MI 49506, cassette $21.95, disk $24.95 plus $2 S/H*

Blackbeard's Island, a 32K Hi-Res graphics Adventure requiring a disk drive wherein you, Tom Wentworth, wash ashore on Captain Edward Teach's (a.k.a. Blackbeard) island paradise. Can you find his treasure before the volcano erupts? *NOVASOFT, 4285 Bradford N.E., Grand Rapids, MI 49506, disk $19.95 plus $2 S/H*

Buzzworm, a 32K maze arcade wherein you guide Buzzworm to eat snakebait and gain points. But as Buzzworm grows longer, it must avoid biting itself; Buzzworm bites are fatal. *NOVASOFT, 4285 Bradford N.E., Grand Rapids, MI 49506, cassette $15.95, disk $18.95 plus $2 S/H*

Color Car, a 64K racing arcade game requiring joysticks. Among the hazards are other drivers, air and water jumps. *NOVASOFT, 4285 Bradford N.E., Grand Rapids, MI 49506, cassette $19.95, disk $22.95 plus $2 S/H*

Gold Runner, a 64K arcade game with joystick option. The object is to collect all the bricks of gold on the screen, avoid the guard and reach the top of the screen where an escape ladder appears. *NOVASOFT, 4285 Bradford N.E., Grand Rapids, MI 49506, cassette $14.95, disk $17.95 plus $2 S/H*

Moneypoly, a 32K CoCo version of the popular board game "Monopoly" requiring joysticks and containing all the features of the original game. *NOVASOFT, 4285 Bradford N.E., Grand Rapids, MI 49506, cassette $19.95, disk $22.95 plus $2 S/H*

Panic, a 32K arcade game requiring joysticks. The object is to dig holes and wait for a Meany to fall in, then bury him before he gets out. *NOVASOFT, 4285 Bradford N.E., Grand Rapids, MI 49506, tape $14.95, disk $17.95 plus $2 S/H*

Scepter of Ursea, a 32K graphics Adventure requiring a disk drive wherein you explore the countryside and harbors of exotic Ursea where dragons dwell. *Prickly-Pear Software, 2640 Conestoga Avenue, Tucson, AZ 85749, disk 29.95 plus $1.50 S/H*

EARS, a 32/64K audio recognition device to allow users to train CoCo to recognize their voices for hands-off programming. Up to 64 voice prints can be loaded into memory and then saved to tape or disk. *Speech Systems, 38W 255 Deerpath Road, Batavia, IL 60510, $99.55*

The Best Screen Dump Utility for Epson Type Printers, a 16K screen dump utility featuring three sizes of printouts (11 by 7 cm., 17 by 17 cm. or 28 by 28 cm.), double-strike option for darker printouts, reverse printing switch and use of double-density, bit-image mode. *CMD Micro Computer Services, Ltd., 10447-124 Street, Edmonton, Alberta, Canada T5N 1R7, cassette $14.95 plus $2 S/H*

The Disk Pilot, a 32K disk maintenance utility that features error trapping, complete information on any file including granules used, size, execute addresses, copies, kills, renames files and is cursor driven. *CMD Micro Computer Services, Ltd., 10447-124 Street, Edmonton, Alberta, Canada T5N 1R7, tape $14.95 plus $2 S/H*

Disk Utility Package, a 32K utility including the following programs: Archive, to save tape to disk; Backup, supports 40-track systems; Format, replaces `DSKINI`, will work with 35- or 40-track systems; Find, reports all occurrences of a pattern; Compare and Menu. *CMD Micro Computer Services, Ltd., 10447-124 Street, Edmonton, Alberta, Canada T5N 1R7, disk $19.95 plus $2 S/H*

HIRES+, a 16K high resolution text display with BASIC enhancements. Features include true upper- and lowercase displays with 24 lines and scroll protection, same version for either cassette or disk systems, variable line width and instant change between two character sets. *CMD Micro Computer Services, Ltd., 10447-124 Street, Edmonton, Alberta, Canada T5N 1R7, cassette $19.95 plus $2 S/H*

Label Maker 3.0, a 32K ECB utility for printing labels compatible with all types of printers. Features include Hi-Res screen preview before printing, automatic centering, all defaults can be customized and same version for cassette or disk systems. *CMD Micro Computer Services, Ltd., 10447-124 Street, Edmonton, Alberta, Canada T5N 1R7, tape $19.95 plus $2 S/H*

Magazine Index System, a 16K utility requiring a disk drive to keep track of magazine articles. Features include transfer utility insuring compatibility with other database programs, fast search routines and the saving of data in a compressed format for more records per disk. *CMD Micro Computer Services, Ltd., 10447-124 Street, Edmonton, Alberta, Canada T5N 1R7, disk $14.95 plus $2 S/H*

CBASIC, a 32/64K programming utility requiring a disk drive to convert Color BASIC programs into machine language programs. Features include over 100 BASIC commands and functions that support disk, tape, screen and printer I/O, high and low resolution graphics, sound, play and string operations. Also included is a full-featured BASIC program editor using a 51.64 or 85-by-24 line display. 64K is recommended. *Cer-Comp, 5566 Richochet Avenue, Las Vegas, NV 89110, disk $119 plus $2.50 S/H*

Speak Up! 3.3, a 16/32/64K text-to-speech converter using just over 7K. Features include voice synthesizer requiring no additional hardware, may be embedded in BASIC to give your programs voice and documentation with hints to help CoCo's pronunciation and change the pitch of voice. *Educational Micro, Inc., 1926 Hollywood Blvd., Suite A620, Hollywood, FL 33020-4524, cassette $29.95*

Insights into Personal Computers, a book of general information about PCs with overviews of the history of PCs, the anatomy of the portable computer, the role of communication technologies in the PC revolution and chapters dealing with the structure capabilities and design of PC software. *The Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, NY 10017-2394, $29.50 plus $2 S/H*

Trigger 64, a 64K machine code utility for the CoCo 2 that acts as an interface between *EDTASM* and BASIC, allows switching between the two and EXECs ML routines in BASIC with crash-proof *EDTASM* edit buffer. *Master Creations, P.O. Box 2040, Pine Bluff, AR 71613, cassette $34.95, Arkansas residents please add 4% sales tax*

OTERM, a terminal emulation program requiring 64K, OS-9, at least one disk drive with controller, a deluxe RS-232 Program Pak, TRS-80 MultiPak Interface or PBJ CC-Bus and modem. *OTERM* permits you to use CoCo as a terminal to access BBSs, information services or any host computer (even another CoCo) that supports communication with remote terminals. *New World Technologies, Box 1209, Dublin, OH 43017, $39.95 plus $2 S/H*

Kansas City BASIC, an OS-9 implementation that requires 7K for the program and approximately 2K for data and program storage. Feature enhancements include functions such as PEEK and POKE, variables dynamically located, sequential and random disk files provided using standard operating calls, OS-9 Shell commands can be executed from command line and ability to add floating point math. *Steve Odneal, 8609 East 73 Terrace, Kansas City, MO 64133, disk $25*

Tele Addresser, a 64K record-keeping utility requiring a disk drive. Features include over 1,000 records per disk, printing of address labels, telephone record organization, telephone directory printing, sales call formatting and sequential alphanumeric ordering of any field users select. *PKM Software, 1117 Denton Street, Lakeland, FL 33803, disk $49.95 plus $2.50 S/H*

Software Success, a book by Brian King advising programmers on how to market software successfully. Included are chapters on planning a software business, finding markets for software and deciding what software to market. *Potomac Pacific Engineering, Box 2027, Gaithersburg, MD 20879, $4.95*

Investograph, a 32K ECB investment analysis tool requiring a disk drive. Features include analysis of price and volume data (high, low and closing prices and trading volume) for stocks, bonds, listed puts and calls, stock indexes, stock futures, mutual funds and commodities. *Radio Shack Stores nationwide, disk $49.95*

Orchestra-90CC, a 16K combination of software and hardware to make you maestro of your own electronic orchestra and transform CoCo into a programmable music synthesizer. Features include a cartridge that connects CoCo's I/O connector to your stereo to produce a stereo synthesizer; six octave ranges; up to five simultaneous voices using two stereo channels; Music Language programming method that lets you enter all components of a piece of music line by line; four or five voices, each of which can be assigned to any of five instrumental choices (tone color registers); one program in ROM allowing you to create, play, load, edit and save to tape or disk; and a Transfer Mode to transmit files via a 300 Baud modem. *Software Affair, distributed by Radio Shack, available at Radio Shack stores nationwide, $79.95*

BriteFace, an intelligent serial-parallel interface requiring a Centronics compatible parallel printer, a 110-volt, 60 Hz power source and CoCo with Color BASIC 1.1 ROM or later, which samples incoming data and computes transmission rate for maximum efficiency. *Spectrum Projects, Inc., P.O. Box 21272, 93-15 86th Drive, Woodhaven, NY 11421, $59.95 plus $3 S/H*

The *Seal of Certification* program is open to all manufacturers of products for the Tandy Color Computer, regardless of whether they advertise in THE RAINBOW.

By awarding a *Seal*, the magazine certifies the product does *exist* — that we have examined it and have a sample copy — but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to THE RAINBOW's reviewers for evaluation.

— Monica Dorth

Trivia — A Question Feast For The Trivia Buff

True or False? Henry Fonda played the leading role in the movie *High Noon*.

If you answered "true," shame on you. Everybody knows Gary Cooper was the star of one of the last great movies of an era that was dominated by cowboy heroes. Clint Eastwood? He was just an also-ran on an old TV series called *Rawhide*.

Here's one for you sports fans: Who is the leading home run hitter of all time in baseball's major leagues?

Babe who? How long has it been since you've been to a game? The correct answer, of course, is Henry Aaron. Now, who was Aaron playing for when he connected on his historic blast? How old was he?

If such information captures your interest, welcome to the growing club of trivia buffs who thrive on bits and pieces of sometimes inconsequential facts from the past. You will probably also enjoy *Trivia*, a new quiz program from Moore Computer Services featuring 500 questions in the following categories:

A) Entertainment, Movies, TV, Music
B) History, Geography, Politics
C) Art, Literature, Science, Nature
D) Sports, Games, Leisure
E) Mixed Subjects (all of the above)

Something for everybody, right? Well, most of us anyway. If your interest isn't listed, don't fret; in the documentation accompanying the program, Moore promises there will be 23 additional "volumes" released during the next few months.

They seem to have thought of everything. There is a 32K disk version, a 32K cassette version and even a 16K cassette version (which has eight different quizzes of 50 questions each — four on each side of the cassette). All three versions feature three clock speeds, for beginners, advanced players and geniuses, respectively.

Extended BASIC is not required, they note, which is good for those who do not have this feature on their CoCo. What this means, of course, is that graphics are held to a bare minimum. It also means you're looking at a screen that is largely green most of the time, except for the questions. By turning down the color on the TV, my eyestrain was greatly alleviated.

The authors appear to have done thorough research on the questions in every category. And they show a lot of thought in the questions selected — except for the true and false questions, most of them have up to eight multiple choices.

You have two opportunities to answer the questions (unless it's in the true or false category) and your score for that turn depends upon how fast you answer before time runs out. There's a clock at the bottom of the screen, which is at once helpful and distracting, especially if the question is a difficult one.

After answering the question, you're ready for another. However, I found the flashing prompt "Press any key for the next question" to be unnecessary and downright irritating — especially after trying to beat the clock on the previous round. It had a kind of neon-light effect, trying to dazzle me when I wasn't in the mood for it.

I was also a little annoyed that there was no random selection of questions. They seem to be in the same order for every category every time the game is played. There is too much programming information readily available for the authors not to take advantage of it.

Aside from these minor irritations, *Trivia* is a good program. And if the authors follow through with 23 additional volumes, I'm sure we'll see some dramatic improvements along the way. They are off to a good start.

(Moore Computer Services, 1090 East Country Club Circle, Plantation, FL 33317, cassette $19.95, disk $21.95)

— Charles Springer

ADOS ENHANCED, EPROM-ABLE DISK BASIC

Now, you can supercharge Basic with an impressive array of extra features WITHOUT sacrificing compatibility! ADOS is compatible with virtually 100% of commercial software. Customizing utilities are provided to allow user-defined command abbreviations, baud rate, step rate, tracks per disk (35 or 40), support of double-sided drives, and more. After customizing ADOS, you can have it burned into an EPROM that plugs into the Disk Basic ROM socket, or just use it in RAM as a 64K disk utility. (EPROM + burning will cost about $20--we provide information concerning how you can have this done.) Features include: • repeat and edit of the last direct-mode command • 26 definable control-key abbreviations • automatic line-number prompts • DOS command • lowercase command entry (a fine complement to a Lowerkit or PBJ WordPak) • COPY (filename) to (drive number) • AE error override option • RAM command (64K) • RUNM command • text echoing to printer • ML monitor • text file scan • enhanced directory • error trapping • hi-res text utility included (42, 51, or 64 characters per line)

"I COULD NOT FIND ANY SOFTWARE THAT WOULD NOT RUN UNDER ADOS."
THE RAINBOW, December 1984

"I LOVE ADOS! . . . A GENUINELY FIRST RATE PRODUCT."
Color Micro Journal, February 1985

"I WON'T PART WITH MY ADOS EPROM FOR ANYTHING . . . NO COMPATIBILITY PROBLEMS."
Hot CoCo,May 1985

Disk . . . $27.95

THE PEEPER ML PROGRAM TRACER

Monitor machine-language programs AS THEY ARE RUNNING! Peeper actually timeshares with the target program, giving FULL CONTROL as ML programs run. Switch instantly between watching regular program output and Peeper's trace of registers and stack on screen or printer. Inspect memory in any of 26 display modes. Execution speed can be varied from full speed to the barest crawl, or halted entirely, as programs run. Single-stepping, breakpoints, memory or register examine/change. Relocatable, supports 64K use. (16K required) See February '85 review.

Disk . . . $23.95 Tape . . . $21.95 Assembler source listing . . . Add 3.00

FASTAPE THE NEXT BEST THING TO A DISK DRIVE

Fastape allows cassette I/O at 3000 baud--TWICE NORMAL SPEED. It uses the high-speed (POKE 65495,0) mode, and makes it convenient to stay in this mode throughout. Features automatic adjustment of cassette and printer parameters when speed mode is changed. Control-key functions for many Basic commands and for changing speed modes. Compatible with all file types, and can be used with Telewriter-64 and many other tape utilities.

Tape . . . $21.95 (16K required) See July '83 review.

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Hint . . .

Recording CoCo Music

If you want to record the sounds produced by the CoCo's sound generators (say, from a music program), you can do it easily using the cassette recorder (if you use one with your CoCo) by unplugging the smaller gray plug or entering `MOTORON`. Note that this doesn't apply to speech or sound generator packs you may have plugged into the cartridge port.

Sugar Software

COLOR DISK MANAGER

Color Disk Manager will do selective initializations, verifies, backups, repairs and much more!

- will initialize single tracks, a range of tracks, or the entire disk to more than 35 tracks
- allows you to make a backup of the directory out of reach of basic and put it back if a directory crash occurs; has a recover file command which will load entire files off the disk if the directory crashes and the allocation table is good; will repair or salvage crashed disk several ways
- is 64K compatible allowing a 64K backup; does backups by track, a range of tracks, or the whole disk (will do more than 35 tracks)
- gives an allocation table map with granules x-referenced to tracks and sectors, and showing which granules are used; displays a file granule map showing which granules, tracks, and sectors the file uses, and the length
- will do a directory displaying file names in two columns, the number of free granules, and the free bytes if below 65535; has a kill file command
- loads and saves, sectors, tracks or files; loads files two ways, as done by basic, or with header bytes left in, which helps in studying how files are saved on disk; has an append sector command
- verifies tracks or the entire disk showing the track and sector if an error occurs, with the option of continue or stop
- is multiple drive compatible
- allows you to save a block of memory to disk; transfers programs from tape to disk
- has a rapid scan feature which allows you to scan the disk by tracks and sectors using the arrow keys
- will dump memory to the screen in ascii, good for listing basic programs or source files; has a move memory block command, and a transfer control command
- converts decimal to hex or hex to decimal
- allows you to examine memory using the arrow keys with displays in hex (or decimal) and ascii
- will load and execute rompac's saved on disk; has a move rom to ram command
- allows you to change origin (start addr.) of ML programs; displays the start, end, and execute addresses of ML programs
- **32K - 64K ECB $34.95 Disk**

RAINBOW SCREEN MACHINE

- Add these features to your computer/program: ML extension of Basic loads on top of 16, 32, or 64K machines to enable easy mixture of **hi-res graphics and text** in your programs. Dense text or large lettering for children, visually impaired or VCR title screens with no programming!
- User definable 224 character set featuring lower case descenders, Greek, cars, tank, planes, etc., completely interfaced with **all keys, commands, and PMODES.** 12 sizes (most colored) from 16 x 8 to **64 x 24. PRINT @, TAB and comma fields are fully supported.**
- 2 distinct character sets automatically switch for sharpest lettering featuring **underline, subscript, superscript, reverse video, top and bottom scroll protect, double width, colored characters in PMODE 4, and help screen.**
- Simple 2-letter abbreviated commands inside your program or **control key** entry from keyboard, even during program execution!
- Includes demo program, **character generator** program and manual. 16K Basic required — 32K recommended. **$29.95 Tape; $32.95 Disk.**

COLOR TAPE MANAGER

- merges multiple basic programs into one; appends multiple machine language programs into one; appends machine language to basic (example included)
- converts numbers from hex to decimal or decimal to hex; allows input in hex or decimal
- rapidly scans memory using the arrow keys with auto-key repeat
- displays memory in hex (or decimal) and ascii; allows the changing of memory in decimal or hex
- deals with missing end of file blocks; loads and saves data with or without a filename block
- handles programs with varying block lengths
- displays the start, end, and execute addresses of ML programs; displays the buffer start, end and top addresses
- converts ML programs into basic data statements which can be loaded as, or merged with, a basic program
- turns the audio and cassette motor on and off with one key commands; has inverted displays which lessen eye fatigue
- finds the end of programs on tape even from within a program with a skip file command; allows the transferring of control to other programs with a go command
- moves blocks of memory from start through end address to new start address; allows the changing of the origin (start adds) or ML programs
- has an 8,380 byte loading buffer with 16K systems and 24,760 byte loading buffer with 32K systems
- **16K ECB mimimum $19.95 Tape $22.95 Disk**

SUPER SCREEN MACHINE

All of the features of Screen Machine and more:

- Variable **SMOOTH Scroll** for professional displays, listings, business use.
- Variable volume **KEY Click** (tactile feedback).
- **EDTASM+ command** for instant compatibility with cartridge EDTASM.
- **Superpatch+ command** for instant compatibility with the Superpatch+ Editor- Assembler.
- True **Break key** disable and recognition.
- 10 User Definable commands used to activate your special drivers or subroutine.
- Dynamic **Screen Dump command** for use with Custom Software, Engineering's Graphic Screen Print program for simple printer "Snapshots" of your screen even during program execution!
- Super Screen Machine - **$44.95 Tape; $47.95 Disk.**

Screen Machine can be used in games, word processors, utilities, etc. In addition, the custom graphics characters can be used to develop easy, effective hi-res character-graphics programs. The potential is truly unlimited.

Screen Machine is fully interfaced with all keys and commands. Although some Basic programming knowledge is recommended just a few minutes spent studying and referencing your computer's Basic manuals will turn you on to the power of computing with Screen Machine.

Screen Machine can be used to directly create video recorder title screens or large lettering for children or the visually impaired simply by typing.

Dealer and author inquiries are always welcome. Canadian dealers should contact Kelly Software Distributors, Ltd., P.O. Box 11932, Edmonton, Alberta T5J-3L1, (403) 421-8003.

Disk software compatible with Radio Shack DOS only.

SUGAR SOFTWARE
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Hollywood, Florida 33021
(305) 981-1241

A complete catalog of other sweet Sugar Software products is available.

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Get Organized With Easy-To-Use *Merge 'n Mail*

I need to get organized. My boss keeps telling me to get organized, my wife thinks I should get organized and my kids think I should get my stuff together. It's not that I am a sloppy person, I just use the "file by pile" method of storage and retrieval. When something comes in I need to keep, I put it in a pile. The problem is that I end up with piles of stuff here, there and everywhere, and I spend too much time rooting through piles looking for stuff I know is there, but I just don't know where.

All I needed was the correct software to help my CoCo store things and retrieve them on command in a usable format. To my assistance comes *Merge 'n Mail* from the folks at Computerware. Designed primarily as a mailing list maker, this program has additional capabilities and also functions as an easy-to-use mini-database.

The emphasis with this program is on ease of use. Unlike *dBASE III*, which I have great difficulty using because of its complexity, *Merge 'n Mail* is very easy to use.

The fields which would normally be used to generate a mailing list are preset. These fields are:

	Maximum characters
Last Name	15
First Name	13
Company	26
Address	30
City	20
State	2
ZIP	5

There is also a set field for telephone numbers.

Additionally, there are up to 12 fields which can be configured by the user. For these fields, the user also specifies the number of characters each field contains. Once these fields are set, changes can be made to the data stored in the data file, but not to the fields themselves and their characteristics.

These additional fields can be used to store information which you want to store about the person, but not necessarily print on a mailing label (such as birthday, spouse's name, etc.). Examples are given in the well-documented instruction manual. These would aptly pertain to a computer club. In that instance, pertinent data could be the number of drives, maximum memory and date dues are due.

Merge 'n Mail can also print out the data on standard 8½ by 11-inch sheets as well as labels. Two choices are offered: long listing with all the programmable fields, or a short listing with just the name and address fields.

For printers offering compressed printing (132 characters in the normal 80-column space), the program allows you to enter the printer control codes for compressed and expanded typestyles to obtain maximum function from your printer. My DMP-100 does not have this capability, so I used the standard short listing mode which worked just fine.

Once data has been entered, it can be recalled for examination, changes, additions or deletions. Several search options are given to assist you in finding a particular file in the database. As new persons are added to the database, the entire file is re-sorted by last name. When labels are printed, you are given the option of re-sorting by ZIP code, since significant mail cost savings are available if bulk mailings can be presorted by ZIP code.

Merge 'n Mail also has a feature which allows you to merge the information in your database into a form letter that won't look like a form letter. (Hence the "Merge" in *Merge 'n Mail*).

After composing a letter on any of the disk-based, ASCII-generating word processors (*Color Scripsit, Telewriter* changed to ASCII output, *VIP Writer*, etc.), you put control codes where you would normally put the name, address and the other data which is now contained in your database files. *Merge 'n Mail* then pulls this data out, prints the information, justifies the remainder of the text and continues onward until the list is completed. *Voila!* Form letters without the "form letter" look. My friends and relatives are going to be surprised when they start receiving letters from me. I've even put a field for birthdays in each file so birthday cards will be on time.

My list of suggestions for improvements for *Merge 'n Mail* is a short one. The first eight fields are fixed regarding subject and field width. While this simplifies the set-up routine for most mailing applications, the lack of flexibility regarding field width creates some problems.

The ZIP code block is set to five spaces, thus eliminating the ability to use the six-digit Canadian alphanumeric postal code. The first name is set at 13 spaces. Enough for one first name, but I ran into problems with entering the first names of married couples I wanted to include on one letter (i.e., Dear Maryanne and William). The ability to specify the field width in the first eight fields would eliminate this problem, or just adding a few more spaces to these field widths would help.

If you are very good at BASIC, you can go into the program and modify it, but be forewarned that it was written to be memory efficient, not easy to modify. I took a peek at the listing and gave up.

The other limitation is only one mailing list can be on one disk, even if it is a very short one. Not a big problem, except that disks (and the required backups) are not cheap.

Merge 'n Mail requires a 64K disk CoCo. This is not a problem with the program, as the features justify the memory required; it just limits the number of potential users.

Overall, I consider it an excellent program — more than just a simple mailing list and less than a full-featured database. Considering the price, it is quite a value.

(Computerware, 4403 Manchester Ave., Suite 102-Box 68, Encinitas, CA 92024, requires 64K, disk $27.95)

— Bruce Rothermel

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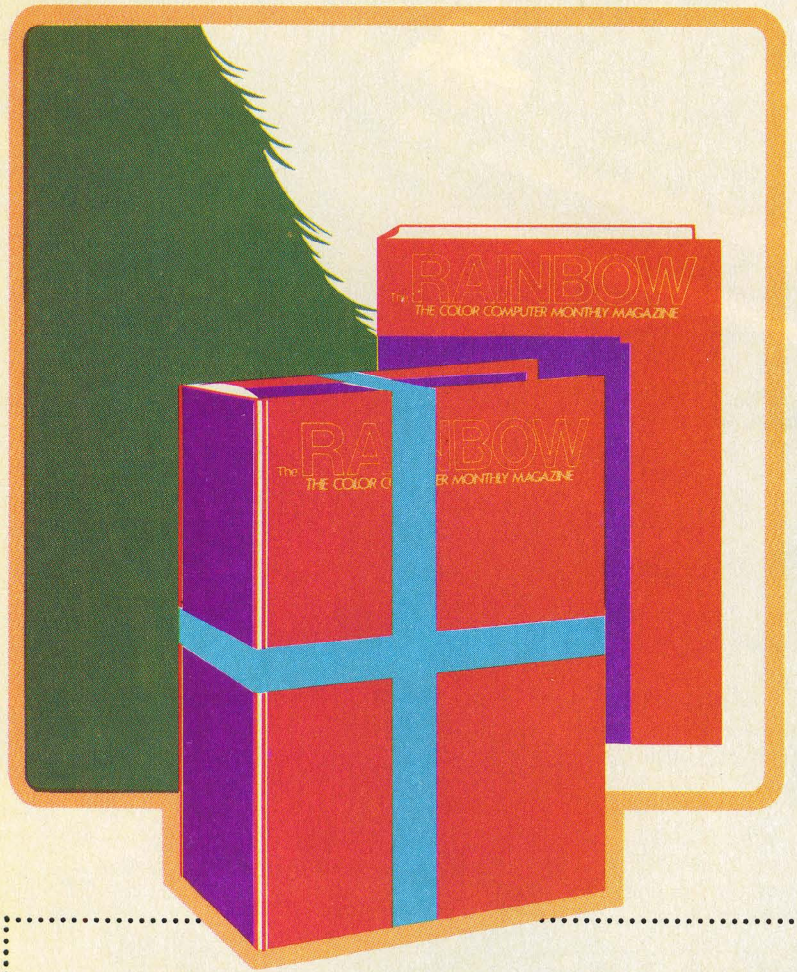
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Guide To Computer Magazines Is Comprehensive And Informative

Are you searching for computer publications to suit your particular needs? Steve Davis Publications has a new book, *Guide To Computer Magazines*, that will make your search easier. *Guide To Computer Magazines* is divided into three major areas: 1) Popular and General Interest Magazines, 2) Trade and Professional Magazines and 3) Newspapers and Newsletters.

Francis Amato, the author, tried to include as many details as possible about each publication. Some of the publishers did not respond to requests for information; consequently, data concerning these publications is rather limited. On the other hand, many of the publishers did respond with a wealth of data. Information such as description of the audience, the editorial scope, regular features and subscription information is provided. (The description of RAINBOW takes up nearly a page.)

One of the most useful parts of *Guide To Computer Magazines* is the "Subject Index." Applicable publications are listed under specific subject areas. This is a partial list of subject areas that CoCo users might find interesting: Computer Languages, Databases, Education, Epson, Games, Graphics, Handicapped, Legal, Tandy/Radio Shack and Telecommunications.

The "Title Index" lists the publications in alphabetical order and gives the page where the publication is described. By using the "Subject Index" and "Title Index" you can quickly find publications that will meet your needs.

Overall, I think *Guide To Computer Magazines* will make a good reference addition to your CoCo library.

(Steve Davis Publishing, P.O. Box 190831, Dallas, TX 75213, $9.95)

— Gabriel Weaver

One-Liner Contest Winner . . .

Run this graphics One-Liner and see how long your eyes can last!

The listing:

```
0 POKE65495,0:S=1:Z=RND(-TIMER):
PMODE4,1:COLOR0,1:PCLS:SCREEN1,0
:DRAW"BM0,0":FORZ=0TO1STEP0:A=RN
D(192)-1:DRAW"M=Y;,=A;":Y=Y+4:S=
NOTS:SCREEN1,S+2:IFY=>255THENY=0
:DRAW"BM0,0":NEXTELSENEXT'
RAINBOW-----FLASHWAVE----1 LINER
        BY MARC ANDREESSEN
```

Marc Andreessen
New Lisbon, WI

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Adventures* and its companion *Rainbow Adventures Tape.*)

Personal Bookkeeping 2000 Has Significant Improvements

Personal Bookkeeping 2000 is an enhanced version of *Personal Bookkeeping 84*. In the November 1984 issue of THE RAINBOW (Page 214), I did an extensive review of *Personal Bookkeeping 84*. This version is basically the same program, except the author has modified many of the areas I found objectionable in the original review.

Those improvements include the ability to easily define your own expense categories rather than have to live with those selected by the author. In the original program, it only provided for check numbers of three digits; you can now enter four digits. I think this will meet the needs of most users. You can now easily add service charges to your accounts which makes it much easier to reconcile accounts.

In the earlier version, it was assumed we all would make entries into our bookkeeping system on a daily basis. Because of this you had to go back to the main menu to change dates. With *Personal Bookkeeping 2000* that is not necessary and, believe me, it makes data entry much more user friendly, especially for those who enter these type records on a weekly basis.

Another significant improvement is in the documentation. It's more clear than the original and the author has included a tutorial that shows how to use most of the major functions of the program.

Personal Bookkeeping 2000 is a powerful program that is user friendly. It provides the user with a wealth of information. It requires 32K ECB, disk drive and printer.

(AMDT-Stardancers, 762 Brady Avenue, Bronx, NY 10462, disk $39.95 plus $1.50 S/H)

— Michael Hunt

One-Liner Contest Winner . . .

This one-liner, inspired by some previous one-liner contest winners in THE RAINBOW, is called *Cosmic Birdhouse.*

The listing:

```
10 CLS:PMODE1,1:PCLS:SCREEN1,0:D
RAW"BM45,61;L50E70F70R10U20R10D1
10L100U10R20U5L25D10R105H4G4H10E
6U5L20D6L120D40R200F5E5F5E5F5U20
0L99D100L100U40BM47,67;E5F5G5H5"
:PAINT(40,44),2,8:PAINT(200,62),
4,8:PLAY"L25;A;03;A+;A-":FOR X=1
 TO 1120:NEXT X:GOTO 10
```

Michael Holt
Victoria, British Columbia

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Simulations* and its companion *Rainbow Simulations Tape.*)

Probaloto — Not Just A Random Number Lottery

It's in the news a lot lately: "Local Citizen Wins Millions in State Lottery." With more and more states getting into the lottery business, *Probaloto*, by Gary Olander, may be just the ticket for you.

The documentation points out that *Probaloto* is not "just another random number-generating lottery program"; the object, however, is to pick the numbers to win you millions. This machine language program is available on tape for 16K ECB, while the version I received on disk requires 32K ECB (or 64K under JDOS). It is well-documented and the program is menu driven — it's so easy to use that after going through the documentation once, you'll probably file it away.

The user is prompted for information about the particular lottery being entered: how many numbers are picked and out of how many numbers. The example given for a regular lottery picks six numbers, from one to 40, but these parameters can be changed. Output can be routed to the screen, or to screen and printer. Printer Baud rates from 300 to 9600 can be selected.

The first three selections from the main menu are strictly random number generators. The first picks three numbers (zero to nine), the second picks four numbers (zero to nine) and the third picks six numbers (one to 40), for what is called the regular lottery game.

The fourth selection from the main menu is labeled "weighted" random selections. This is the feature which makes the program more than just a random number generator. The user has the option of setting up weighted data files using lists of past winning numbers which are available where lottery tickets are purchased. This is easily done by answering prompts to input the number of times each number (one to 40 or zero to nine) has been a winner. These files can be labeled and saved to disk (or tape) and a hard copy can be listed by the printer.

The weighted random selection process can use these data files in one of two ways. If the user feels that the process used to select winning numbers picked twice as many 4s as 17s in the past, and is, therefore, likely to continue that trend in the future, *Probaloto* can weight towards the most-picked numbers. In the example given, the program would be twice as likely to "randomly" select a 4 as a 17. If, however, the user feels that Lady Luck plays her hand such that poor old 17 is due, the program can weight toward least-picked numbers.

This weighted selection procedure can also be used to set up data files which will favor the selection of your lucky numbers, or conversely, tend to avoid your unlucky numbers.

To test this weighting process, I wrote a short BASIC program to generate at random regular lottery-game winning numbers. I input 60 sets of six numbers into a data file and used this to have *Probaloto* make selections weighted toward the most-picked numbers. I then had *Probaloto* make an equal number of selections strictly at random. When these results were compared to my original list, the weighted selections produced 7.5 percent more matches than the random selections. My original list was fairly well-distributed. More pronounced variations in frequencies in the data input would have added to the weighting effect and increased that percentage.

My criticisms of *Probaloto* are very minor. The data file printout produced by the program is a narrow column near the left margin consisting of numbers and the times each has been picked. For a regular lottery game this column is 40 lines long, using much more paper than would be necessary if the output were better formatted. Also, when finished with either printing or saving a data file, the program returns to the beginning with initial questions about your state's lottery. It would be more useful to return to the main menu at this point. Lastly (dare I be so picky?), the word "array" is misspelled on one of the screens.

If you are into playing a lottery and believe the game is truly random in practice as in theory, stick to the random number generator already in your CoCo. On the other hand, if you feel that Lady Luck is not always random and want to use some sophisticated mathematics to bring her in on your side, then *Probaloto* may be just the thing for you. I'll second the program's sign-off message: good luck!

(Gary Olander, 322 Haymarket Pl., Gahanna, OH 43230, 16K ECB tape or 32K ECB disk, $19.95)

— Stanley Townsend

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Dungeon Quest Combines Adventure Intrigue With Arcade-Game Action

Dungeon Quest by Computerware is a graphics Adventure game using a combination of the keyboard and joystick. Both 32K Color BASIC and a joystick are required to play the game. The action is similar to games played on home video arcades which involve using a joystick with a touch pad combination.

In the game, you are a lad named Brodric who has just come of age. He is a restless lad and decides to go out into the world and make his fortune. His father gives Brodric his inheritance, a rusty old sword which is rumored to be magical. As Brodric travels to the East, he hears tales of an underground palace nearby. To make a long story short, the emperor named Darius dies of a plague and, having no heir, decrees that the finder of his crown will rule his empire. The story has it that the crown has never left the keep.

A fortnight later Brodric enters the dungeon and within a few steps the floor gives and he tumbles into the depths of the dungeon. This is where we start our quest; with pencil and graph paper, I began. After several deaths, many hours and a few bottles of eye drops, I found the crown but discovered I did not have the right key to open the door, so the quest went on.

Your disk or cassette comes with two versions of the game, `LOAD` in the version you want and you're off. The game auto-executes; all you need to do to get started is answer the questions: "Do you want to have the objects randomize Y/N" and "Which level of difficulty do you want, 1, 2 or 3?" Both game versions are different, the second being a more complex maze of tunnels, corridors and rooms.

There are several types of treasures which, besides increasing your wealth, also move you up the social ladder. You are only able to carry eight objects at one time, meaning you must make frequent trips back to the start of the dungeon to drop off some of your treasures in order to get more. In addition to treasures, you may also find other weapons or keys to aid you in the game. The joystick control for the character is adequate, but controlling the weapon is difficult at best. In addition to escaping with treasure, you may also increase your score by fighting the monsters.

I found *Dungeon Quest* to be quite enjoyable if I mapped it out. Otherwise, it became merely a pointless trial-and-error search of an extremely complicated maze. If you enjoy Adventures and arcade games, you will surely like this combination of both.

(Computerware, P.O. Box 668 Encinitas, CA 92024, cassette $24.95, disk $27.95 plus $2 S/H)

— Stephen Hess

CoCo Checkbook Disk: As Good As The Tape Version

First, I would like to refer you to the *Color Checkbook* review I did which appeared in the April 1985 issue of THE RAINBOW, Page 210. The very last line of the review reads, "Now all we need is a disk version." Well, that is exactly what we have!

Spectrum Projects is now selling *CoCo Checkbook Disk*, the disk version of this useful utility which allows one to balance the checkbook. This version is every bit as good as the original, and even better for those with disk systems. All of the original features (modified to work with disk data files) are there. The manual is again professionally done with many helpful hints and advice.

FOXX Software has made all of the needed modifications to make this a perfect checkbook balancer. Now we have everything!

(Spectrum Projects, Inc., P.O. Box 21272, Woodhaven, NY 11421, 32K disk $39.95 plus $3 S/H)

— Jim Sewell

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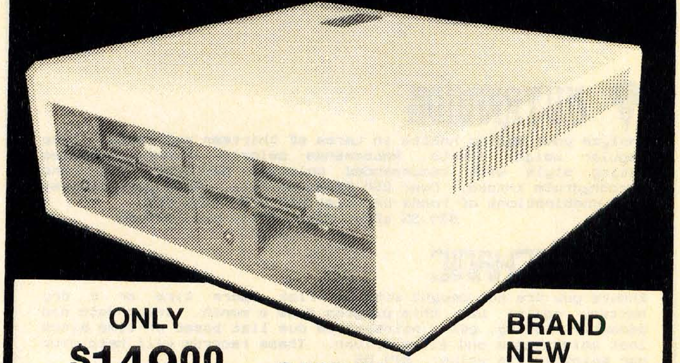

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Print Master Helps Master The Screen Dump

By Dennis A. Church

Print Master, from Dataman International, is a two-program package that helps solve the problem of getting the graphics screen to the printed page. You are thinking that this is a graphics screen dump program. Yes, that *is* what it is, but it is different and more sophisticated in several ways.

Print Master was reviewed from the disk version. It is contained on a single, copy-protected disk and requires a 32K Color Computer; it has some features which take advantage of a 64K CoCo. It is also available on tape.

The main program is titled *PMAST* (for "Print Master"). With it you select from an extensive list of options designed to load your graphics screen and print it out any way you want it. You select and execute options almost exclusively with joystick and firebutton. They call it "clicking the mouse" and it will work with a mouse, but I found the joystick more convenient.

Ease of use for this program is not very user friendly. The question is, will I instinctively know what to do from the choices presented to end up with what I want? The answer is, "No." But I'm one of those who doesn't think "instinctive" programs are all that possible; I expect to need a manual to operate a complex program. I'll just say that *Print Master* presents easy options to those who understand the options. It also recovers from improper input without damage to your work. Though you can `BREAK` in the program, the graphics screens are all intact when you rerun.

The menus available are the Main Menu, File I/O, Image Dump and Dump a Screen. Graphics screens may be loaded from tape, disk, *Graphicom* and *CoCo Max*. Image dump parameters are pixel size (controlling the size of the image), inverse, rotate, dumping more than one graphics screen, shading, tabs, dump using text, as well as a choice that selects a user-programmed option for unique printer codes.

Before dumping one or more graphics screens, you can select the `PMODE` and which screen (or portion of screen) you wish to print. You can have two `PMODE 3/4` screens in memory at once; eight if you are in `PMODE 0`. A 64K computer gives double this area. The added memory also makes it possible to store screens in high memory, load a second screen and print multiple screens in a user-selected order.

Before any image can be dumped, however, the printer driver must be loaded. If you have a printer of the following type, the driver is included with the program (with more promised in time): Tandy, Gemini, Imagewriter, C. Itoh, Spirit 80, Mannesmann Tally and the CGP-115. If you don't have one of these printers, or you want to employ custom codes in the printer driver, the second part of this program comes into play. It is called *The Customizer*.

The Customizer creates a printer driver for use by *Print Master*. Even though it is menu driven, it requires a good understanding of your printer. The manual warns that using *The Customizer* may be difficult because of poor printer manuals and the complexity of dot graphics printing. (That warning rang true on several midnight sessions for me.)

Here is a sampling of knowledge needed to design a custom printer driver: Baud rate, number and configuration of pins in the printhead, Most and Least Significant bit order required and the control codes you want sent to the printer in sets of custom designed strings. *The Customizer* includes a Store Buffer, Clear Buffer and Test Options capability. Bad control codes can be selectively replaced before saving the file. The file you create from *The Customizer* is the printer driver you load to *Print Master* before making a screen dump.

As I mentioned, the manual warns about the complexity of the program. The manual itself is an impressive looking, three-ring binder printed in brown on brown in a curious two-column format. It has an index, a helpful appendix and reproductions of program menus and other illustrations. I suspect the manual was prepared using this program plus two other Dataman programs helpfully explained in Appendix D: *Text Master* and *Graphic Master*. Despite these assets, it still requires a careful, cover-to-cover reading to use the program effectively.

I obtained printouts of their test picture and a *Graphicom* picture you select within *Print Master* from the *Graphicom* menu on both a Gemini-10X and a Line Printer VII. Options to control the size and rotation of the dump worked well. (No, the program doesn't make the LP VII any quieter.)

Now I must fault this program. Using my Gemini-10X printer, the graphics output invariably left a blank line between printhead passes. Using one-by-one pixel size, the blank was one pixel in size. Larger printouts resulted in larger blanks. "Now is the time for *The Customizer*," I

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said to myself. Unfortunately, while the prepackaged screen dumps can be altered and resaved, the driver itself cannot be inspected. I suspected the line spacing was incorrect, but had no way to see what code was sent by the original driver. Further, altering the strings is not possible except by rewriting from the beginning.

I tried to write an original Gemini dump using *The Customizer* from the command strings supplied in the appendix. My efforts, guided by the manual and printer manual, produced a misaligned, garbage-laden printer output. I really do feel the fault lies in my inability to correctly design the program, as well as inappropriate information in the appendix. Of course, the manual could include more information. Instead, it warns about the complexity of designing screen dumps.

Whether or not to buy *Print Master* is, as always, a question of what you need, what you have and what you are interested in. You will find a smoothly functioning, reasonably priced program for your needs if you're in one of these categories: those who need a screen dump program with great versatility for modifying the output, especially with the ability of adding text to the output; those who own an oddball printer requiring a custom designed printer driver; those who use a variety of printers or who plan on changing printers — this program will not become obsolete; and "techie" types (people who will sit up nights designing custom drivers for strange printers that, with joystick selection, will change the screen dump to mirror image, allow five colors or simulate cinemascope movie images). These possibilities are not necessarily *Print Master* program functions until the user can devise the driver, with *The Customizer*'s help, to make them possible.

The manual offers customer support to registered owners. When I called, I spoke to the program's author, Scott Nudds. He was helpful and friendly. He did suggest that users would be better advised to write with their questions in the interest of clarity and economy. From Mr. Nudds' helpfulness, I'm sure he would promptly respond to letters from owners.

(Dataman International, 125 South Fifth St., Lewiston, New York 14092, U.S. prices $33.95 tape, $37.95 disk; 420 Ferguson Ave. North, Hamilton, Ontario, Canada, L8L 4Y9, CDN. Prices $39.95 tape, $43.95 disk)

Personal Program Protection With *EZ Cassette Encrypt* And *EZ Disk Encrypt*

If many people use your disks or tapes and you don't want them to be able to access all of the programs, here is a solution. This solution is very easy to use for disk and a bit bulky, but workable, for cassette.

EZ Disk Encrypt and *EZ Cassette Encrypt* take the file (on disk, any type of file; on cassette, only ASCII files) and exclusive-OR it with any password you choose. Not an extremely stupendous feat, but it does the job.

With *EZ Disk Encrypt*, the program reads the file off disk a sector at a time, exclusive-ORs it with the password and writes that sector back to the same place on the disk. This could present a problem if an input/output error occurs during the process. Only part of the program would be encrypted and it would not be recoverable. You *must* have a backup copy of the file before you use this program!

With *EZ Cassette Encrypt*, the program reads in the entire file before it starts encrypting it. It then does its job and prompts for a name for the output file. This way is not as fast, but it is more reliable than the disk method and the only method possible for cassette. With this procedure, the file can only be so long, but with the disk procedure, a file of any length can be encrypted.

To decrypt a file, rerun the program using the exact same password. It will be decrypted because exclusiveOR-ing is the exact opposite of itself.

Unless you share disks or cassettes with other people and have confidential files on them, I see no real need for these programs. But if you require such protection, then they will work well for you.

(Landware, 6 Larchmont Road, Edison, NJ 08817, cassette $25, disk $29)

— Andrew Dater

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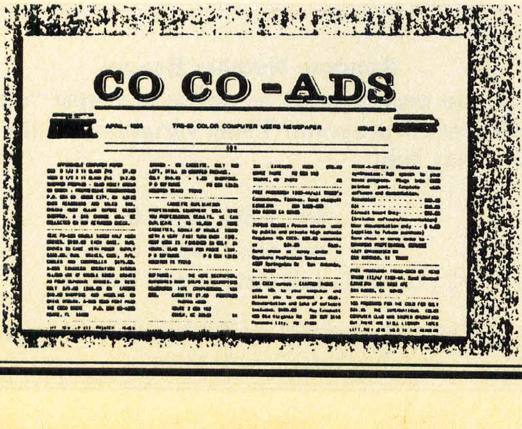

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EZ Profiler Helps Streamline Programming Techniques

So you've finally written the "Great American Program." It has everything, every bell, whistle, toot and honk you could ever want. You allow yourself the luxury of typing those three letters that make all of your dreams come true — R-U-N. A couple of seconds fly by and the screen remains blank; a few more and still not a sound. You panic. How could your masterpiece have crashed the system? As you quickly grope for the Reset button, the title screen you spent three weeks drawing finally appears. Now you realize the problem is something much worse than a system crash: Your program is S-L-O-W!

A high speed `POKE` won't help now. It is time to recode, but what part of the program? *EZ Profiler* by Landware offers an answer, or at least some suggestions.

Before running *EZ Profiler*, the source program must be saved in ASCII format on the disk. A simple `RUN "EZPRO"` will get you underway. Upon execution, the program offers instructions that explain the program more completely than the 2¼-page instruction booklet. *EZ Profiler* will then prompt for the name of the program you wish to modify, and a memory area the input program does not utilize. *EZ Profiler* will access the drive, read the input program and create a new version of the program saved as *TEMP/BAS*. The new version will then be loaded and you must type `RUN` to execute the new program.

Running the newly created program is exactly like running the old version, except for a speed slowdown as the profiler tabulates the execution data. When the source program is terminated by an `END` or `STOP` command or by pressing `BREAK`, a subroutine that is appended by *EZ Profiler* must be executed. This routine will dump the tabulations to either the screen or a printer.

The result is simply a count of how many times each program line is executed, which, according to the instruction sheet, "will show . . . which loops in a program are most heavily used. These loops can then be rewritten . . . to make the overall program much faster."

The major deficiency of *EZ Profiler* is that it offers no suggestions to speed up the code, nor does it even hint at how to determine which routines are truly "wasteful" and which routines are written as tightly as possible. (For example, a `FOR/NEXT` loop might have been executed 500 times, but not necessarily be wasteful.)

The instructions that come with the program are adequate enough to operate the program, but really aren't enough to put the program to use, which is the most important reason for using a utility.

Other problems with *EZ Profiler* include the additional processing time it adds onto the source program (almost a 3,000 percent increase) and the additional memory required. The time factor is only deadly in applications where program flow is greatly changed by timed responses (such as games). In this case, the program is of dubious value.

The memory factor can be dehabilitating. The program appends an additional 20 characters onto each line which, on longer programming endeavors, could prevent the program from loading into memory.

EZ Profiler is not a program that will answer all programming woes. It will help streamline software, but not unless the programmer is willing to put in much more work than the program. *EZ Profiler* is essentially an extension of BASIC's `TRON` command and should be treated as such. It does exactly what it claims, but be wary of reading any other uses into it. Potential purchasers should beware that although *EZ Profiler* can help hone their programming techniques, the work is still up to them. Happy programming!

(Landware, 6 Larchmont Road, Edison, NJ 08817, requires 32K and disk, $20)

— Eric Oberle

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Hint . . .

Random Number Ranges

Have you ever wanted to devise a simple "odd/even" or "heads/tails" program? These variations on the `RND(x)` function may help:

`RND(2)-1`	will yield either 0 or 1
`RND(2)>1`	will yield either 0 or -1
`(RND(2)>1)*2+1`	will yield either 1 or -1

`RND(2)>1` is especially useful because -1 represents a logic "true" and 0 a "false" in BASIC.

EARS Pioneers The Way For Spoken Command Response

By Randy Graham

Personal computing is a piece of cake. Just turn it on and start typing; it all appears right there on the screen. If you make a mistake, back up and correct it. Write programs in many languages. Run software for word processing, spreadsheeting — even play games. Print it all out letter-perfect then save it and share it. Nothing to it. Unless you have no hands to type or no eyes to see the screen.

I work with handicapped people. Jonathan was a lineman before his accident. Because he severed his spinal cord, he is confined to a wheelchair. He has very poor use of his arms; he needs help to dress and to eat. When I met him, he was beating everyone in the rehabilitation unit at chess. I thought that a good chess player ought to make a good computer programmer.

Paul has had cerebral palsy since birth. He can get around with crutches although it is difficult; his arms and legs just won't do what his brain tells them. His speech is difficult for most of us to understand. He is a college graduate and would like to be a writer, but trying to type can be a tearful frustration for him.

As a result of a disease, everything looks blurred to Betsy. She can manage to read with a magnifying glass, holding the material close to her face; she has not been able to find a computer screen she can read.

For Jonathan and Paul and Betsy, the keyboard and screen which give us access to all the marvels of personal computers are just as formidable barriers to computing careers as the six-inch curb which locks them out of a shopping mall or an office building. We can cut notches in the curbs and build ramps around the steps. What can we do to open up our favorite activity to some very fine people?

It was for these friends and others that I flew to the RAINBOWfest in Chicago to find out what Rich Parry and Lester Hands were up to at Speech Systems. It was fun meeting them and I became so excited about their work that I brought an EARS home with me so I could join the adventure. EARS (Electronic Audio Recognition System) is a device and program through which a Color Computer responds to spoken commands.

Yes, I said spoken commands! No other computer has it — just CoCo. We are coming along with voice synthesizers which can electronically vocalize text in memory, but going the other way? Little more than a year ago I attended a conference in which an expert in the field said that speech recognition was not even on the horizon. He was wrong. Say "hello" to the expert, EARS.

What You Get

In a nice plastic envelope you get two pieces of hardware, a piece of software and a very good manual. One piece of hardware is a ROM pack which contains the magic and the other piece is a headset. There are no earphones in the device; it is just there to hold the microphone close to your mouth. The headset plugs into the ROM pack and you know where that goes.

The software (tape or disk) contains a machine language program, a utility and several demonstration programs. Load and execute the EARS program and you are in business. To the user, the effect is that all of your Extended Color BASIC ROM still works but some new commands have been added. Time to start learning.

How it Works

LISN is the first new command you meet. Like all BASIC commands, it can be used in direct mode or within a BASIC program. Type `LISN "1"` and say "one." You have taught CoCo/EARS its first word. Let's note that you have also taught it your accent — and language.

EARS is a "speaker-dependent" system. The user teaches the machine and thereby sets up a unique relationship. There is nothing romantic about this; it seems to be the easiest way to do it. A "speaker-independent" system which can recognize any voice in any accent, pitch and inflection must be much more complex. This way, whether I say "one" or "uno" or "ein," when I say it again, EARS will respond with "one." Space is reserved in memory for a speech synthesizer like *Voice*. If you tell EARS to SAY "one," it will speak it from the speech system.

OK, I have taught EARS one word. I can now repeat that process. In its present shape and form, EARS can "learn" 64 strings. Apparently, the program sets up a two-dimension array. One element is a string of up to 16 characters which I type in. The other element is a voice print of what I say into the microphone. EARS calls this pair a "template." Let's see what I can do with this array.

MATCH lets me use the vocabulary list. After this command, I say "one"; there is a noticeable pause, then the screen prints '1'. EARS has searched the array of voice prints, found a match and printed the character string.

Let's note again that the relationship between the input string and the spoken part is what I want it to be. "Gadzooks" can make the computer type out "My name is Randy" if that is the way I made the template.

What if I forget my own list? TLIST will produce the string part of the list of templates for me one screen at a time. TSAVE will save the whole list of strings and voice prints to tape or disk (EARS checks to see which you are using); TLOAD will load a list so I do not have to do it over every time.

Vocal Programming

Now for the great part. I have taught EARS the digits, alphabet and as many BASIC commands as it will hold. Time for another command.

DRECT instructs EARS to accept BASIC statements from me. I can say "one-zero-a-equals-one-two-three-enter" and a BASIC line appears on the screen. Then, "two-zero-print-a-enter" and the second line is in place. I can say "list" and it will (because I added the "enter" to my string); when I say "run," it does it! Primitive? Yes, but I wrote and ran a BASIC program without touching the keyboard! I feel like I have the first horseless carriage in town.

While in DRECT mode, the computer will accept keyboard input, but it will continue to respond to voice commands until turned off with BREAK.

A Fairy Tale

Jonathan is up and dressed and has finished breakfast. It is time to go to work. He rolls down the hall to the den where CoCo/EARS is waiting. He activates a remote control switch by sound or however and the computer comes on and loads EARS which loads the template list. (This last part will require an enhancement that EARS does not have. Right now, Jonathan would have to leave his computer on and only turn his monitor and peripherals on and off.)

He says "Terminal" and the screen says RUN "TERM .BIN",R (ENTER). Before starting to work, like many businesspeople, he says, "Get Dow." "Get" tells the terminal program to go to its autodial/autologon section. "Dow" calls and logs on to DJNS. At the menu he says "news" and the screen shows //NEWS (ENTER). He goes through the news by menu selections, reads the Wall Street Journal online and logs off. Now he says, "Get office." Autodial and logon gets him into the office computer. Perhaps he will first read "Mail" and "Memo" before calling for the file on which he is working. It is slow and tedious, having to give all digits and spelling out words. But, he is working!

This is only just barely a fairy tale. If you devote 36 templates to the letters and digits, you only have 28 left for words. But TCLEAR will empty the template buffer so you can load another list tailored to the specific application you are running. And needless to say, he will need the help of a typist to construct his template lists.

Come on Along

It sometimes seems like the pioneering days of personal computing are over. Nobody builds his own any more — what did I do with that wirewrapping tool? Hardly anybody writes programs — software is too readily available. Everybody is into graphics. Well, if you sometimes look longingly at the old covered wagon gathering dust in the shed, hitch up. A whole new land mass has been opened for exploration.

Someday there will be listening typewriters that write it all out as you dictate. Other control applications will become as common as digital microwave ovens and calculator watches. And perhaps we will have Hal, the conversational computer, by 2001. But you can still get ahead of the parade. EARS is the place to start, and you can only do it with a CoCo!

I have told you about my excitement with this new tool. I would like to hear from others who are experimenting with EARS for handicapped applications. My complete address is 2115 Buford Road, Richmond, VA 23235. Or, maybe we can share our experiences in the "Letters to Rainbow" department.

I did not write this review with EARS — I am glad I did not have to. It would have taken forever, spelling out each word. If your template list is full, there is a pause of a couple of seconds before the computer responds. And, let's face it, EARS can be quirky. Rich tells you to imagine you are training your puppy. That's the way you must speak. Sometimes I say a couple of words that are not on the template list and get up and walk away. When I do that, I remember the old proverb: "I had no shoes, and complained, until I met a man who had no feet."

(Speech Systems, 38W 255 Deerpath Rd., Batavia, IL 60510, $59.95)

Test Your Management Skills With *PETSTORE*

Pal Creations is marketing yet another Simulation game, this one called *PETSTORE.* The game has you as an owner of one pet store and $200. From there it is simple, just buy animals at a cheap price and sell them at a higher price. The complicated part is that you have to keep track of what the price is for each of 20 animals. These animals come in four categories: fish, snakes, birds and amphibians/reptiles.

If you can remember what the previous prices are for each animal, then it is easy to tell whether to buy or sell. There is some speculation involved, however, in that sometimes even though prices go down, they may go even lower, making you wait longer to realize profits. Another problem you may encounter on the more difficult levels is a greater chance of fire and disease, which will diminish your supply of animals.

The game has little documentation but is fairly easy to play, so it doesn't really need much. If you intend to play the game alone or in a small amount of time, forget it! This game is strictly meant for two to four players and even the quickest game will easily take nearly an hour to complete. *PETSTORE* does, however, have a practical benefit in that it teaches the basic principles involved in the stock market and other speculation-type investments.

The game comes on cassette only, but can easily be moved to disk. For the money, *PETSTORE* is an interesting and educational program which is worth the price.

(Pal Creations, 10456 Amantha Ave., San Diego, CA 92126, distributed by CoCoNut Software, RR#2, Site 9, Box 1, Tofield, Alberta, Canada T0B 4J0, 32K ECB cassette $14.95)

— Mark Anderson

Hint . . .

Putting on the Brakes

When using the STOP command to debug your program, ask for the information you want before you request the STOP action. For instance:

```
10 INPUT "NUMBER";A
20 IF A=3 THEN Y=10:X=30
30 IF A=4 THEN Y=20:X=40
40 PRINT X,Y:STOP
```

Line 40 shows the format I used. It saves typing in the print request after the STOP command has been executed. A little thing, but it has saved me many finger strokes.

George B. Sullivan
New Carrollton, MD

"The CBASIC Compiler"

Now anyone can create fast efficient Machine Language Programs Easily and Quickly without having to use an Editor/Assembler

CBASIC is a fully integrated, easy to use Basic program Editor and Compiler package. CBASIC is 99% syntax compatible with Disk Extended Color Basic programs, so most Basic programs can be loaded and compiled by CBASIC with little or no changes required. The compiler is an optomizing two-pass integer Basic compiler that can convert programs written in Disk Extended Color Basic into 100% pure 6809 Machine Language programs which are written directly to disk in a LOADM compatible format.

The programs generated by the compiler can be run as complete stand alone programs. A built-in linker/editor will automatically select one and only one copy of each subroutine that is required from the internal run-time library and insert them directly in the program. This eliminates the need for cumbersome, often wasteful separate "run-time" packages.

CBASIC WAS DESIGNED FOR BOTH BEGINNING & ADVANCED USERS

CBASIC is a Powerful tool for the Beginner or Novice programmer as well as the Advanced Basic or Machine Language programmer. The Beginner or Novice programmer can write and compile programs without having to worry about Stack Pointers, DP registers, memory allocation, and so on, because CBASIC will handle it for you automatically. All they have to do is write their programs using the standard Basic statements and syntax. For the advanced Basic and Machine Language programmers, CBASIC will let you take command and control every aspect of your program, even generating machine code directly in a program for specialized routines or functions.

CBASIC adds many features not found in Color Basic, like Interrupt, Reset, and On Error handling. It also has advanced programming features that allow machine level control of the Stack and Direct Page registers, variable allocation, automatic 64K RAM control, program origin and even multiple origins. It can even have machine language code generated within a program that executes just like any other Basic program line.

FULL COMMAND SUPPORT & SPEED

CBASIC features well over 100 Basic Commands and Functions that fully support Disk, Tape, Printer and Screen I/O. It also supports ALL the High and Low Resolution Graphics, Sound, Play and String Operations available in Extended Color Basic, and all with 99.9% syntax compatibility.

CBASIC is FAST. Not only will CBASIC compiled programs execute 10 to 1000 times faster than Basic, but the time it takes to develop a CBASIC program versus writing a machine language program is much, much shorter. A machine language program that might take several months to write and debug could be created using CBASIC in a matter of days or hours, even for a well experienced machine language programmer. We had a report from a CBASIC user that claimed "a Basic program that used to take 3 hours to run, now runs in 7 to 8 minutes". Another user reported a program that took 1 to 1½ hours to run in Basic, now runs in 5 to 6 minutes!!!

MORE THAN JUST A COMPILER

CBASIC has its own completely integrated Basic Program Editor. The Editor contained in CBASIC is used to Create and/or Edit programs for the compiler. It is a full featured editor with functions designed specifically for writing and editing Basic programs. It has built-in block Move and Copy functions with automatic program renumbering. Complete, easy to use inserting, deleting, extending and overtyping of existing program lines. It is also used for Loading, Saving, Appending (merging), Killing disk files and displaying a Disk Directory. It also has automatic line number generation for use when creating programs or inserting sequencial lines between existing lines. You can set the printer baud rate and direct normal or compiled listings to the printer for hard copy. The built-in editor makes program corrections and changes as easy as "falling off a log". If CBASIC finds an error when compiling, it points to the place in the program line where the error occurred. All you have to do is tell the editor what line you want to start editing and when it is displayed, move the cursor with the arrow keys to the place where the error is and correct it. Just like that, it's simple.

HI-RES & 80 COLUMN DISPLAYS

CBASIC is the only Color Basic Compiler that includes its own Hi-Resolution 51, 64 or 85 by 24 line display. It is also the only compiler that supports both the PBJ "Word-Pak" and the Double Density 80 column cards. All of these display formats are part of the standard CBASIC compiler package. Not only can these display formats be used for normal program editing and compiling, but CBASIC will also include them in your compiled programs! If you want CBASIC to include the display driver in your program, all you have to do is use a single CBASIC command "HIRES". The run-time display driver that CBASIC includes in your program is not just a simple display, but a full-featured display package. With the Hi-Resolution display package you can mix text & graphics, change characters per line, underline, character highlight, erase to end of line or screen, home cursor, home & clear screen, protect screen lines, and much more. All commands are compatible with our HI-RES II Screen Commander so you can easily develop screen layouts using HI-RES and Color Basic before you compile your program. The same applies to using the 80 column card drivers. What other Basic compiler offers you this kind of flexibility?

64K RAM SUPPORT

CBASIC makes full use of the power and flexibility of the 6883 SAM (Synchronous Address Multiplexer) in the Color Computer. It will fully utilize the 96K of address space available in the Color Computer (64K installed) during program Creation, Editing and Compilation. CBASIC has a special command for automatic 64K RAM control. When used in a program, it allows the user to use the upper 32K of RAM space automatically for variables or even program storage at run-time. It will automatically switch the ROMs in and out when needed. There are also two other commands that allow you to control the upper 32K of RAM manually, under program control. No other Color Basic compiler directly supports the use of 64K RAM like CBASIC.

ALL MACHINE LANGUAGE

CBASIC is completely written in fast efficient Machine Language, not Basic, like some other Color Basic compilers. Because of this, CBASIC can edit and compile very large programs. Even using the Hi-Resolution 51 by 24 line display, it can work with about a 34K program, and the 80 column card versions can handle almost 40K of program. Some of the other Basic compilers can only work with 16K or about 200 lines. Even working with large programs, CBASIC compiles programs with lightning fast speed. It will compile a 24K program to disk in less than 2 minutes! That's without a listing being generated. We've heard stories about some other compilers that take almost 10 minutes to compile a simple 2-3K program. You might inquire about this when you look at some of the other compilers available.

THE FINISHED PRODUCT

Since CBASIC contains statements to support ALL of the I/O devices (Disk, Tape, Screen & Printer), Hi-Res Graphics, Sound, and Enhanced Screen displays, it is well suited for a wide range of programming applications. It generates a complete, Ready to Run machine language program. The finished product or program does not have to be interfaced to a Basic program to perform some of its functions or commands. This may seem obvious to you, but some of the other Color Basic compilers don't necessarily work this way. Some of their compiler commands need a separate Basic program in order for them to work. In some cases, require that a separate Basic program be interfaced to the compiled program to perform I/O functions, like INPUT, PRINT and so on. CBASIC doesn't do this. ALL of its commands are compiled into a single machine language program that does not require any kind of Basic program to make it work.

COMPATIBILITY

You may be wondering about those statements we made earlier concerning 99% or 99.9% syntax compatibility. What does that other 1% consist of? The biggest part of that 1% has to do with string arrays and variables. CBASIC does not use a "String Pool" like Color Basic. It uses absolute memory addresses to locate string variables and arrays. This is why CBASIC's string processing is so fast, it also eliminates the time consuming "Garbage Collection" problem. When CBASIC allocates space for strings, it must know how much space to use for each string. When you Dimension a string variable in CBASIC, you must tell it how much space you want to save for each element. To Dimension an array of 40 strings, 64 characters each, you would DIM DA$(40,64). If a string is not dimensioned, CBASIC will automatically allocate 32 bytes for it. If you want a single string to have enough room for 200 characters you would DIM AX$(200). For string arrays, you would still access the element you want, the same as Color Basic, to get string #30 from the array DA$, you would still use DA$(30), the only real change is in the DIM statement. For undeclared string arrays of 10 elements or less, CBASIC will automatically reserve space for 10 (0-9) strings of 32 characters. In some other Color Basic compilers, you have to declare EVERY string variable used in the progrm in a DIM statement. And, to create an array of 40 strings with 64 characters each, you would have to DIM AD$(2560), and then to access string #30, you would have to multiply 30 × 64 and use a special variable name format or access it one character at a time. Not very compatible or convenient to use, and difficult at best.

CBASIC REQUIREMENTS

CBASIC requires a minimum of 32K RAM and at least one Disk drive. We strongly recommend that you have 64K. CBASIC is compatible with all versions of Color & Extended Basic and both Disk Basic V1.0 and V1.1. Programs compiled on either system will run on systems with different ROMs. CBASIC is NOT compatible with JDOS.

DOCUMENTATION

The Documentation provided with any program is very important to the user. This is especially true when you talk about a program as complete and complex as CBASIC. Even though CBASIC was designed to be the most User Friendly compiler on the market, we went to great lengths to provide a manual that is not only easy to use and understand, but comprehensive and complete enough for even the most sophisticated user. The manual included with CBASIC consists of approximately 120 pages of real information, not like some manuals that put just one or two short paragraphs on a page. If we did it that way, we could have easily created a three or four hundred page manual. The manual index breaks down each section of the manual and gives a 3 or 4 word description of each section and its items along with page numbers. The manual has three sections, the Editor, Compiler and Appendix. Each of these is divided into subsections, with Section and Subsection titles printed at the top of each page. If you want to, you could find the information you are looking for by simply flipping through the pages and scanning the Section titles on the top of the pages. The Manual itself is an 8½ by 11 Spiral Bound book with durable leather textured covers. Some of the reports we have had from CBASIC users describe the manual as being the Best program manual they have ever used.

COMPARE THE DIFFERENCE

CBASIC is not just another Color Basic Compiler. It is the only complete Basic Compiler System for the Color Computer. Compare CBASIC's features to what other compilers offer and you'll see the difference. When comparing CBASIC to other compilers, you might want to keep some of these questions in mind. Does it support I/O functions? You can't write much of a program without PRINT, INPUT and so on. What about complex string statements, or string statements at all? How large of a program can you write? Can you compile a complex string like: MID$(RIGHT$(DA$(VAL(IN$),LEN(LE$)),3,3)? Can you use two character variable names for string & numeric variables, like Basic. Does it support all the Hi-Res graphics statements including PLAY, DRAW, GET and PUT, using the same syntax as Basic? Do you ever have to use a separate Basic program? Can you take complete Basic programs and compile them without extensive changes? Will they work? How do you edit a program when it has errors compiling?

PRICE VERSUS PERFORMANCE

The price of CBASIC is $149.00. It is the most expensive Color Basic Compiler on the market, and well worth the investment. We spent over 2 years writing and refining CBASIC, to make it the Best, most Compatible Color Basic compiler available. Most of our CBASIC users already bought one or more of the other compilers on the market and have since discarded them. We even traded in a few of them. If you want a cheap compiler, we'll sell you one of those traded in, at a good price. Before you buy a compiler, compare the performance of CBASIC against any Color Basic compiler. Dollar for Dollar, CBASIC gives you more than any other Color Basic compiler available.

ORDERING INFORMATION

To order CBASIC by mail, send check or money order in the amount of $149.00 plus $3.00 for shipping and handling to the address listed below.

To order by VISA, MASTERCARD or COD, call us at: (702) 452-0632 (Monday thru Saturday, 8am to 5pm PST).

CER-COMP
5566 Ricochet Ave.
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Football Statistics Package Keeps Thorough Stats

Football Statistics Package is a well-written statistics program for those who want to keep records of their team and its opponents. It requires 32K, one disk drive and a printer. For those with only one drive, it will be necessary to switch from the program disk to the data disk when prompted. According to the author, the package is designed to track little league, high school, college or any level desired. It is not a league secretary but can be used for one if desired. It is primarily designed around one team, with individual, team and opponents stats.

Football is completely menu driven and very user friendly. Single key entries are used when possible, and there are many submenus to make things simple. An easy-to-understand, nine-page documentation booklet is included to give you a general overview of the package.

After running the boot program, you are asked to enter the number of drives and Baud rate of your system. The main menu program is used to move from item to item. When returning from a support program, you are returned to the main menu.

There are many features of this program that are too numerous to mention, but a few which appear on the documentation cover are: Mid-season entry, update and additions; Correct and review all stats in file; Correction on all input screens; Raw dump of data to the printer — for the player and opposing team's files; Summary of the player and opposing team's stats; Track 90 individual player stats; Summarize 17 cumulative team stats; Summarize 28 cumulative opposing team stats; Team summaries of 87 stats; Comparative summary printouts 63 stats for your team; Comparative summary printouts 62 stats for opposing team; and over 350 total possible stats to record.

Included with *Football* are two disks: One is the system disk which includes all the support programs; the other is a sample data disk with 75 team members' stats recorded. I did start my own data disk and just used my imagination for all the individual player's statistics, but soon gave up as the task was very monotonous because of all the different statistics to be entered.

Finally, I decided to try number 11 from the main menu (RUN TEAM SUMMARY) using the provided data disk. The following was printed on the 21-page team summary: my score and the opposing team's scores in each quarter, the total score, penalties, penalty yards and first penalty. Then my team's roster was printed, which included each player's number, height, weight, year (or grade) and position played. Next, for each of the 11 opposing teams recorded, each of my player's and the opponent team name was printed, with the total quarters played and number of plays for each individual. This amounted to about 12 pages. After that, the passing stats for certain quarterbacks were printed, including passes attempted, passes completed, yards, intercept, first down and touchdowns.

To save space, I will only list the last six stat sections printed: Rushing stats, Receiver stats, Kickoff team, Kick receival team, Punting team and Punt receival team. The last two total sections were for defensive and opponent team stats.

There was a small problem with the *PRINT/DAT* program. CoCo gave me a syntax error in Line 170 when the program began to run. This was a result of a `FILES 3` statement, in conjunction with my 1.0 disk ROM which has a few bugs. A simple fix for this is to type `FILES 3` from the command mode before running *Football.*

Overall, I was impressed with the ease of use and wide variety of options and functions. If you are interested in keeping track of your favorite football team, and don't want to keep notebooks full of your sloppy writing, help our economy and purchase *Football Statistics Package*!

(Sugar Software, 1710 N. 50th Avenue, Hollywood, FL 33021, printer and 32K required, disk $29.95)

— Darren Nye

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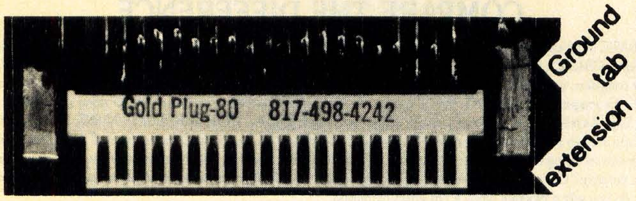

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Sound Generator For The Sounds Of Your Life

Sound Generator is a program that allows the custom design of sounds. As the instructions explain, sound is a combination of sound waves and loudness. With this program you can enter any wave form desired. You are also allowed to enter the "sound envelope," which is simply the varying loudness of the sound. Either of these can be entered graphically or numerically.

To get started, the instructions tell you how to load in either of the two sets of wave and envelope tables recorded on the program tape. They then take you step by step through most of the commands available, showing you how to use them. The first command is to allow you to draw or view the table. The second will allow numeric entry of either table. There are commands to allow changes of pitch, number of envelopes to be played and cassette save and loads.

Others allow the listing of the table values to screen, delete current table from memory, stretch table, end program, shrink table and duplicate table values. Three of these need some explanation. The first, stretch table, takes the current table and duplicates each element, truncating the last half of the current table. Shrink table will delete every other element, leaving the last half of the table empty. The last, duplicate values, will take the portion of the table entered and repeat it until it reaches the maximum table length, allowing you to enter only part of a repeating table.

There is one other command which is excellent for sound synthesis. This command will allow you to create a machine language sound effects routine. The way it works is by prompting for the pitch and number of repetitions of each note to be played. It will then use the wave form and envelope tables to play each of the notes entered. This is great for playing songs.

If you are interested in sound synthesis I recommend *Sound Generator*. Although there seems to be an expectation of a previous knowlege of how sounds are generated, the instructions are helpful enough to get you started. From there you can experiment and learn what you didn't already know.

(Tothian Software, P.O. Box 663, Rimersburg, PA 16248, cassette $19.95)

— Jim Sewell

See You At
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BASTXT Puts A Variety Of Options At Your Fingertips

By Dale Shell

If you do a lot of BASIC programming and you are getting tired of seeing the same old green and buff screen, Valley Micro Systems may have just come to your rescue with *BASTXT*. *BASTXT* was developed to enhance BASIC, adding 21 more commands and eight functions. It also adds high resolution text to the graphics screen. *BASTXT* requires 64K and at least one disk drive.

There are two text screen modes with *BASTXT*, 32 by 16 and 42 by 16. The 32-by-16 mode should allow most BASIC programs to run unmodified. The 42-by-16 mode is very handy, but remember when the `PRINT@` statement is used, it will not cover the entire screen. Mode 42 will also not allow any color or inverse highlighting commands to be used. Some of your BASIC programs may have to be modified, but this mode allows almost a third more information to be displayed on the screen.

Inverse highlighting is invoked using the INVERSE ON command. The INVERSE command can be used two ways. INVERSE can totally reverse the text and background colors. The second use, highlighting text, is very useful to call attention to special words on the screen.

Another way to bring attention to certain parts on the screen is to underline words. This can be done using the ULINE ON/OFF command. It can be used to underline any text printed on the screen. Once this feature is turned on, it will underline everything that goes to the screen until it is turned off, even if the program running is stopped.

BASTXT has many features to enhance the appearance of your screen. Smooth scrolling is available; with SMOOTH ON, the screen is scrolled up a pixel at a time instead of a line. This slows the scrolling down considerably. Another way to slow things down is with the SPEED command. This command changes the speed at which characters are printed to the screen. The default, SPEED 0, is the fastest, with SPEED 255 being the slowest — it really creeps along at a snail's pace. You can choose any speed in between.

BASTXT also has a PAGE command which causes the scrolling to pause every time the screen fills up. Two other commands allow you to tab to any horizontal or vertical position (i.e., XTAB and YTAB). A WINDOW command has also been included. This command allows you to protect from zero to 14 lines of text at the top of the screen from scrolling. You can still use `PRINT@`s to get into the window, but the window is protected from commands like `CLS` and WCLS. WCLS is a fancy way of clearing the screen. It makes the screen sort of "dissolve" away. You can also disable the BREAK key with a simple command, BREAK ON/OFF.

There are three different cursors you can choose from, or you can edit and create your own. The three that come with *BASTXT* include an underline (nondefinable), a single block (single-character definable) and a man waving his arms (seven-character definable). A SCAN command is

The next four commands, BLACK, RED, BLUE and NORMAL, provide four different colors of printing. The NORMAL is close to BLUE but appears to be a different shade. All these can be used together and in conjunction with the INVERSE command; they can yield some interesting displays. INIT is used to put all the commands back to their default values and EXIT is used to disable *BASTXT* and return your system back to normal BASIC.

The eight functions available are comparable to assembly code instructions. I will not describe their functions but will list them. If you are familiar with machine language, then you will probably have a good idea of what they do. They are: COM(0-255), ARSL(0-255), LSL(0-255), ROL(0-255), EOR(0-65535,0-65535), ARSR(0-255), LSR(0-255) and ROR(0-255).

A program also comes on the disk which allows you to customize the defaults of *BASTXT*. It will also allow you to customize the cursor or any other character.

Valley Micro Systems has done a lot of work and they have developed a very useful product, but "every silver lining has its clouds," as they say. I tried to evaluate *BASTXT*'s compatibility with as many DOSs as I could get my hands on. *BASTXT* appears to be fully compatible with KDOS and works fine if the DISABLE command is used with ADOS before booting the program. It would not work with JDOS version 1.11; a later version was not available. Of course, the Radio Shack DOSs worked fine. I didn't have other DOSs available to try.

Valley Micro Systems disabled the DOS command. It is stated that "this was done to facilitate compatibility with all ROM revisions." I use the DOS command on most of my diskettes from the PUTDOS article in RAINBOW, included to cause the computer to pause until a key is pressed. This seems the same as `EXEC 44539`.

November 1984 (Page 140). I wish they would put that command back.

Because the `BACKUP` command uses some of the graphics area of memory, you cannot use `BACKUP` with one single-sided disk drive. If you have two drives, or are using a double-sided drive as two singles, you can use `BACKUP` from one drive to another. You just cannot use the single drive backup. Also, when using `BACKUP`, the graphics/text screen will go "bonkers" and fill up with garbage. Don't worry, this is normal, just press the CLEAR key when the backup is finished.

One other good feature of *BASTXT* is the ability to enter BASIC commands in lowercase. However, if you want the program to print text in lowercase, you have to insert the text with the `EDIT` mode. You must also be careful not to enter a command in lowercase when in the `EDIT` mode or you will get the old SN Error.

Now for the bottom line. All considered, I believe *BASTXT* is a very useful and well-done program *if* you are aware of its limitations. They may concern you or they may not be limitations at all. If you do a lot of programming, you will enjoy the different options you will have at your fingertips. The WINDOW, ULINE, INVERSE (etc.) commands can provide some very impressive displays. But, if you give or sell your program to someone who does not have *BASTXT* and you use some of the effects and features of *BASTXT*, the person who gets the program will not be able to use it. You may want to contact VMS about including their program embedded in your own if you want to market it.

(Valley Micro Systems, 801 W. Roseburg Avenue, Suite 200, Modesto, CA 95350, disk $34.95)

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Hint . . .

Unpacking BASIC Programs

If you have come across a program that has had its lines packed so tightly that parts of the lines can't be seen when listed, here is a way to make them visible again in a 64K CoCo. First `RUN` a program, such as this one from Frank Hogg, to put the CoCo in its 64K model:

```
10 'ROMRAM
20 CLEAR999
30 DATA26,80,190,128,0,183,255,2
22,166,128
40 DATA183,255,223,167,31,140,22
4,0,37,241,57
50 FORI=1TO21:READA:A$=A$+CHR$(A
):NEXTI
60 P=VARPTR(A$)+1
70 POKEP,126
80 EXEC P
90 PRINT"BASIC IS NOW IN RAM"
```

Then simply enter `POKE &HB816,4`. This poke into the BASIC interpreter will allow the full line to be listed. This `POKE` will affect the `LIST`, `LLIST` and `ASCII` save functions, but will not affect the `EDIT` mode.

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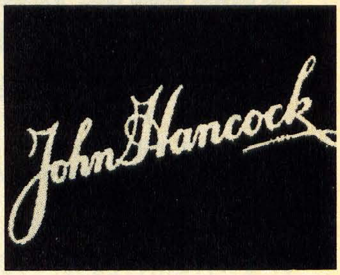

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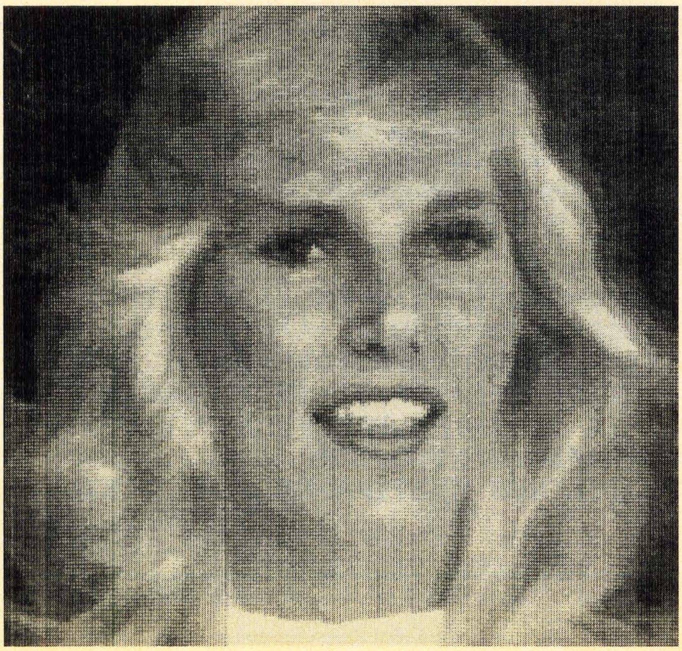

CoCo Echo Gets It All In Writing

I was just thinking the other day about how nice it would be to get a hard copy (a hard copy is a printed copy) of anything typed from the keyboard, so I was happy to receive *CoCo Echo* for review.

CoCo Echo is available from Tothian Software. There were two versions of this program on the cassette. The first version of this program, *ECHOLO*, is for use with 16K machines with or without Extended Color BASIC. The second version, *ECHOHI*, is for use with at least a 32K machine with or without a disk drive attached.

To use the program with a 16K Non-Extended BASIC machine, you will need to type `POKE 359,126` and ENTER after you type `CLOADM:EXEC:` and ENTER. To turn the program off, you will need to type `POKE 359,57` and ENTER.

To use the program with a 16K Extended BASIC machine, all you need to do is type `CLOADM:EXEC:` and ENTER, and you're ready to go. *CoCo Echo* will load into the first graphics page of memory. This is fine, though, because this program will print only text and not graphics.

After the program is loaded, you have to separate functions at your command. The first function is a screen dump. This will cause the contents of the text screen to be dumped to the printer. The text screen consists of 32 lines; it is the area from the top of your TV screen to the bottom of the screen. To use this function, you need to press the SHIFT and right-arrow keys at the same time.

The second function of *CoCo Echo* will take whatever text is typed from the keyboard and send it to the printer. To use this function, you need to press the SHIFT and down-arrow keys at the same time. You can end this duplicating process at any time by pressing the SHIFT and down-arrow keys a second time.

As I have a 16K Extended BASIC computer, I was only able to try out the first version of *CoCo Echo*. I was happy with the ease of operation. Although the instructions I received with the program were very short, I had no trouble getting it loaded and running.

Since I wanted to try out the 32K version of this program, I called my local Radio Shack store and explained what I wanted to do. When I got to the store, Don (the manager of the computer center), took me to a computer, set up the printer and let me go. With a 32K computer, you need to type `CLEAR 200,32580` and ENTER before you type `CLOADM:EXEC:` and ENTER. This will load the program into the top of your computer's memory and out of your way. You use this program in the same way you use the 16K version. Once again, I had no trouble with the program operation.

Some of you might be asking yourselves, "Gee, it sounds like a good program, but what could I use if for?" Well, let's say you would like a directory of programs. No problem! If you have a disk drive, just type `DIR`, ENTER and you will get a hard copy of the directory. How about if you're typing in a BASIC program; just turn on the duplicating process and while you're writing your program, you'll be getting a hard copy of the listing at the same time. These are just two suggestions for the use of *CoCo Echo*. I'm sure if you buy it you will find more.

As you might have already guessed, I think *CoCo Echo* is a very useful program. I had no trouble at all getting it to work and it did everything it was supposed to do. If you have a need for this type program, I would recommend it.

(Tothian Software, P.O. Box 663, Rimersburg, PA 16248, $9.95)

— John H. Appel

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Here's a One-Liner called *Rug Weaver*. It has 40 different patterns and can draw them in three colors for a total of 120 different "rugs." The program uses only two line statements, but the space between each line is the secret.

The listing:

```
0 C=RND(4)+4:P=RND(10)+5:PMODE3:
PCLS:COLORRND(3)+1:SCREEN1,1:FOR
Y=30TO160STEPC:FORX=50TO210STEPP
:LINE(X+10,Y+10)-(X,Y),PSET:LINE
-(X-10,Y+10),PSET:NEXTX,Y:FORT=1
TO3000:NEXT:GOTO'
>THE RUG WEAVER<>BY JIM COCKRUM<
```

Jim Cockrum
Martinsville, IN

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Adventures* and its companion *Rainbow Adventures Tape*.)

Telepatch — An Excellent Enhancer For *Telewriter*

By John R. Curl

When I first got *Telewriter-64* last year, I was in heaven. I couldn't believe the program's versatility and ease of use. I didn't have to study the manual and several other books for a month before I could start using it. I didn't have to remember complicated command strings. Most of my documents were less than six pages long. This was the word processor I had been looking for.

As time went on, though, I began making a mental wish list of things *Telewriter-64* didn't have that it needed. This list included key click, block move, key repeat, easier disk I/O and more. *Telewriter-64* was still the word processor for me; I just wished it had some little improvements.

Enter Spectrum Projects' *Telepatch* by Bob Van Der Poel. As the name implies, *Telepatch* is a *Telewriter-64* enhancer. It adds all of the above improvements and more. After using it for a week, I can't believe *Telewriter* never had the enhancements that *Telepatch* provides.

Telepatch requires a 64K Color Computer with at least one disk drive. You must also have the disk version of *Telewriter-64*. Even with all of the enhancements, the basic functions of *Telewriter-64* are still the same.

Installation of *Telepatch* is very simple. First, make a backup of your *Telewriter-64* and *Telepatch* diskettes. (Never use your originals!) Next, format a blank diskette (known as the destination diskette). Insert the *Telepatch* diskette and type `RUN "PATCHER"` and press ENTER. After this, all you have to do is follow the prompts — it's as simple as that.

When finished, your new systems diskette should have the following programs on it: *TW64/NEW*, *T/BAS*, */*** and *TSPOOL/BAS*. These four programs handle everything including disk I/O. *TW64/BIN* is the new patched *TW64/BIN*. *T/BAS* replaces *U/BAS* as the boot program. */*** is the new disk I/O routine replacing *S/XXX*, *S/BIN* and *S/ASC*. I'll discuss *TSPOOL/BAS* later in the review.

To boot your patched *Telewriter-64*, just type `RUN "T"` and press ENTER. You will be greeted by a new title screen. It states that *Telewriter-64* is "modified, improved and made better in many ways" (it's the truth). You won't notice anything different on the main menu or the format menu. However, the Disk I/O menu has been totally replaced.

The new features added to the editor are: True Block Move, Visible Carriage Returns, Key Beep, Key Repeat, Lowercase, Faster Cursor Movement and Overstrike Mode.

The new boot program is the best improvement. With regular *Telewriter-64*, I had to set all of the print parameters in the format menu before I could print a document. This aggravated me very much! With the new boot program, you can set almost all of these parameters beforehand and not have to worry about them. This is made possible because the boot program now uses the `POKE` command to set the parameters.

You can also determine whether or not the new features are on or off. All you have to do to change a parameter

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or to turn a feature on is use BASIC's `EDIT` command to change different values in the boot program. The manual explains the procedure and also gives the different values that you need.

The format menu's printing parameters that can be set are: page numbering, spacing, queue function, printer type, one-page function, where to put the page number, characters per line, upper margin, bottom margin, left margin, lines per page and printer Baud rate. As you can see, almost all of the format features can be set to any default value needed.

The editor features which can be set in the boot program include: editor screen's background color (green or buff), key click on or off, key click length, key click tone, key-repeat rate, repeat delay, shift-repeat delay, lowercase/uppercase toggle and overstrike/insert toggle.

There are also several disk I/O parameters that can be changed in the boot program. These are: verify on or off, default drive number, binary or ASCII I/O default and drive stepping rate (for those who have drives which can run faster than 30 ms).

While I'm on the subject of disk I/O, I will explain the features of the new disk I/O driver. With the original *Telewriter-64* if you wanted to switch between binary and ASCII I/O, you had to exit the program and load either *S/BIN* or *S/ASC* and then save this as *S/XXX*. That's quite a hassle. With the new driver, */***, all you have to do to toggle between binary or ASCII I/O is press the 'I' key at the disk I/O menu. No more problems. When the "Kill" function is selected, you will be asked if you are sure you want to kill the file. You will also be asked if you are sure when you try to read in a file and there is already text in the buffer.

The program will also remember the last filename used. Thereafter, this will be the default filename for any I/O functions. If you would like to change the default filename, press the '@' key at the disk I/O menu. You will then be prompted for the new default filename. All other disk I/O funtions still operate the same.

I will now explain the *TSPOOL/BAS* program. In order to run this utility, you must exit to BASIC from the disk I/O menu, and type `RUN "TSPOOL"` and press ENTER. This utility program allows you to print a file to the disk instead of a printer. This means the file will be printed to disk in the exact same format as if you had printed it on paper: margins and spacing will be observed, centered text will be centered and pages will be numbered.

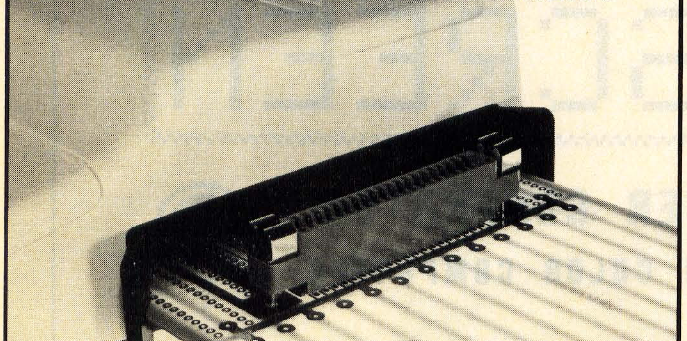
This enables you to print the file at a later time using a simple little BASIC program with the `LINE INPUT` command. You don't have to have *Telewriter-64* to print the file on a printer. Just `OPEN` the file on disk, `LINE INPUT` the text from the disk and then `PRINT#-2`, the text. You would have to actually use this feature to appreciate it.

The only limitations of this utility are that it will only work with files that have been saved in binary format and it will not work with files that have embedded 'Q' (queue) commands.

Telepatch is an excellent program. It adds several outstanding features to *Telewriter-64*. In my opinion, whether you already own *Telewriter-64* or are thinking of purchasing it, you must purchase *Telepatch* in order to get the most benefit from *Telewriter-64*.

(Spectrum Projects, Inc., P.O. Box 21272, 93-15 86th Drive, Woodhaven, NY 11421, $19.95 plus $3 S/H)

6809E SYSTEM DEVELOPMENT



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Software Review

RS232IO Allows Adaptation Of Compatible Peripherals

Why do you need an RS-232 I/O program? Well, we can start out by saying that the four-pin DIN connector on the back of your CoCo is not in itself a complete user port. Programs are often required to allow the use of this port to drive RS-232 compatible devices.

The software packages for the CoCo that make use of this port are usually dedicated to a specific hardware device such as graphics screen dump programs and telephone modems. But what if you want to control some special purpose device such as a robot? What software would you use?

RS232IO is a short (134 byte) machine language program which provides the CoCo programmer with the tools needed to run just about any peripheral from the CoCo port that is RS-232 compatible. The program is multi-saved on cassette tape and a nine-page instruction manual is supplied.

The software is not copy protected and backup copies for the original owner are easily made. The program can also be saved and executed from disk and is fully relocatable to any unused RAM area which can be protected with a `CLEAR` statement, or it can be stored in a graphics page without the need for a `CLEAR` statement.

While the documentation is thorough, it must be studied carefully. Several spelling errors were found, but did not prevent comprehension of the information. The author gives in detail how to load and make use of the software. As written, it provides one start bit, two stop bits and eight data bits to be either sent or received via the CoCo RS-232 Port.

After loading *RS232IO*, it is necessary to `POKE` in five variables which control where in RAM the data for sending and/or receiving is stored. They are:

1) Data In Count — Counts each data byte received from one to 256.
2) Match Byte — If the match byte is the same value as the received data, transmission stops. It can be turned on/off with a poke.
3) Data In Address — Tells the computer where in RAM to store the received data.
4) Data Out Address — Tells the computer where in RAM to store the data to be sent.
5) Data Out Count — Counts each data byte sent from one to 65536.

By simply poking these addresses with this program in RAM, you are able to "customize" your RS-232 port. Receive and send Baud rates can also be changed. One word of caution, however: This is not a ready-to-run, menu-driven program; rather, it allows the user to develop his/her own BASIC programs that call the *RS232IO* as a subroutine.

With *RS232IO* and some BASIC programming skills, the user can adapt many RS-232 compatible peripherals that do not offer companion software for the CoCo.

(Racine, 5220 Birmingham, Tacoma, WA 98409, $30)

— Jerry Semones

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Contributions to THE RAINBOW are welcome from everyone. We like to run a variety of programs which will be useful/helpful/fun for other CoCo owners.

Program submissions must be on tape or disk and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs. All programs should be supported by some editorial commentary explaining how the program works. Generally, we're much more interested in how your submission works and runs than how you developed it. Programs should be learning experiences.

We do pay for submissions, based on a number of criteria. Those wishing remuneration should *so state* when making submissions.

For the benefit of those who wish more detailed information on making submissions, please send an SASE to: Submissions Editor, THE RAINBOW, The Falsoft Building, Prospect, KY 40059. We will send you some more comprehensive guidelines.

Please do not submit programs or articles currently submitted to another publication.

Nutriguide Lets CoCo Guide Calorie And Nutrition Intake

By J.B. Garner

Nutriguide, by Homesoft Company, is a fun program enabling the user to analyze meals or daily food intake in terms of 13 basic nutrients, ranging from calories to cholesterol. The program also enables you to keep a regular weight chart, advises on recommended calorie intake to maintain reasonable weight levels and indicates how your present eating style compares with recommended calorie, protein, fat and carbohydrate intake.

I am neither a dietician nor a nutritionist but, as a biostatistician, I have analyzed the data pertaining to several research projects in which daily nutritional intake was of critical importance. At present, one project is closely monitoring the sodium (salt) intake of patients with high blood pressure. Another researcher is attempting to prevent the re-formation of gall stones (after first chemically dissolving them) by recommending a diet relatively high in fiber and protein. All these studies have shown me the importance of our everyday diet to our state of health and how useful it is to monitor, in nutritional terms, our daily food intake.

Nutriguide comes on a disk together with an 18-page booklet. The disk contains several programs, including a very large food file, which are all run from a single program, *NUTRIENT*. The programs are written in BASIC, apart from the food file, and an attractive initial screen display which mixes text and Hi-Res graphics. The whole program is very disk interactive.

The booklet gives detailed, step-by-step instructions on how to use *Nutriguide* and how to use each program option. It contains the index of the 658 types of food in the food file and gives a useful summary of elementary nutritional information.

The author recommends making a separate disk copy for each person using *Nutriguide*, since the space remaining on a single-sided disk is limited. As I wanted to try out the program with my family, I copied it file by file onto a double-sided disk (J&M DOS) without problems. After entering `RUN "NUTRIENT"` and watching the Hi-Res display (which informs you the program is written for people between 25 and 50 years of age, between 56 and 70 inches in height for women, and 61 and 75 inches in height for men), you are presented with a menu of options: Set Up Personal File, Daily Nutrition Report, Examine Weight Record, Start New Weight Record, Recipe Evaluation, Food File Menu and End This Program.

The limitations by age and height affect only the recommendations included in the program; the breakdown of food intake into nutrient components remains informative to all users.

Selecting Option 1, you are prompted to give your name, frame size, gender, height and activity level. The program then prints two weight values, between which your ideal weight is prescribed and a recommended range of daily

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calorie intake. All these values appeared very reasonable to me (as a layperson).

You then have the option to store this information to disk. The program does not give a file extension and so the disk ROM adds the default extension "/DAT," saving the file under the label NAME$/DAT. The program next asks whether you wish to create a new weight record and creates a file containing the date and your weight. This time the program replaces NAME$ by NAME$ and "/WGT" and creates a file. Unfortunately, the program then fails to strip off the /WGT extension from NAME$ and I had repeated FD Errors in Line 77 before I tracked down this small omission. A quick fix is to insert: `NA$ = LEFT$(NA$,LEN(NA$) - 4)` as the second to last statement in Line 193 of program *NGUIDE/BAS*.

The Daily Nutrion Report allows you to enter each food consumed during the day, item by item, by standard serving, ounce or gram, and then, at the close, lists the caloric, protein, fat, carbohydrate, calcium, iron, sodium, vitamin A, thiamine, riboflavin, niacin, vitamin C and cholesterol content of your meals. Probably, for most of us, this is a sufficiently long list, although other nutrients are of daily interest such as potassium (or the potassium/sodium ratio), fiber and alcohol. The program requests the date and your weight, then compares your intake with recommended intakes and predicts the future effect on your weight of continuing consumption in this manner.

The Recipe Evaluation option enables you to add additional items to the permanent food file. You enter each ingredient (and amount) of the recipe and the program analyzes it into its nutritional components just as described above, requests a definition of the amount of a standard serving and then (optionally) adds the recipe to the permanent food file. Very nice!

The constituent breakdown of any food item in the food file may be examined by using the Food File option. At present you cannot send this breakdown to the printer; hopefully this facility will be added in later versions.

Finally, by using the Examine Weight Record option you will see a Hi-Res plot of your weight values (up to 14 daily values) on a graph which also shows horizontal bars at ideal and various obese weights for people with gender and build similar to your own.

The author has tried very hard to construct an informative and entertaining nutrition program. The disk contains a great deal of nutritional information, and the programs interchange and run each other very nicely. *Nutriguide* runs fine with 32K and does not seem to require the advertised 64K. About 120 commercial foods and beverages, such as Burger King and Coca-Cola products, are included together with 540 basic foods in the food file. However, there are some surprising omissions: table salt, coffee, tea, ordinary (non-whole wheat) flour, meat drippings (for gravy) and fried eggs, for example.

In the review copy of the program there are still one or two rough edges, such as an occasional spelling error and an omission or two. Judging by the overall care taken with the program, I am sure these small difficulties will soon be solved.

If you have a general interest in your own nutrition, *Nutriguide* is a good program to buy!

(Homesoft, P.O. Box 8, Supply, NC 28462, $29.95)

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CoCo Calligrapher Captures Calligraphy's Penmanship

"What," you ask, "is a calligrapher?" Well, the phrase "Once upon a time" is a good beginning. Way back in the old days (well before CoCo) the world's scholars often wrote their manuscripts using a quill pen. A quill pen is a large feather with a hollow stem which was used to hold ink (and was often plucked from a large, unsuspecting bird). The beautiful penmanship that often resulted is known today as "calligraphy"; it is a skill learned with a great deal of practice.

Today's calligraphers use much more modern tools to practice their art. Special pens and inks allow unique and beautiful printed text. Most high school diplomas and college degrees are good examples of calligraphy as are formal invitations to weddings and graduations, and so forth.

Now this attractive printing technique can be accomplished with your 32K Extended Color BASIC CoCo and a bit-image printer. Printers such as Epson, Gemini, several Radio Shack, Okidata 92, Banana and the Prowriter 8510 can be used. The resultant lettering on the printed page is approximately 36 point or ½-inch high letters which are variably spaced at an average of 13 upper- or 26 lowercase per line. The Epson, Gemini and Prowriter also provide the capability to center the text as well. These printers also allow the use of condensed letters which will double the number of characters per line. The maximum number of lines per message is 17.

The disk version supplied for this review worked beautifully. It contained three fonts: Old English, Gay Nineties and Cartoon. Each was tried with no problems. The program is menu driven and requires the type of printer to be selected and the appropriate Baud rate to be set (600 Baud default).

After the printer is set up and online, the program will ask you to select any of the three supplied fonts or you can select a special font. While the instruction booklet does not state what these special fonts are, the advertisements appearing in RAINBOW do list quite a few optional fonts sold separately. The three that are supplied, however, are excellent and the results must be seen to be believed. I used the Old English fonts to make up several certificates for our church members; they were genuinely impressed and could not believe they were the result of a computer program!

A nice feature of the program is that automatic lowercase is selected during the menu option to print your message. This makes your keyboard respond like a typewriter in that you must press the SHIFT key to get a capital letter. If you prefer all uppercase, you can press SHIFT-0 as is done in BASIC. In any case, after the message is printed, the program will take you back to the main menu in uppercase for further selections or additional copies. Provisions are made to save the text onto tape or disk, depending on which version you have, and also to correct or change the text.

The four-page instruction booklet is complete, well-written and to the point. A 90-day exchange warranty is included and a procedure for making personal backup copies of the software is explained.

I liked *CoCo Calligrapher*. It offers many uses for the CoCo user and provides expansion capabilites through the use of optional fonts. So put away your quill pen and see how high-tech can be used to simulate an ancient art form.

(Sugar Software, 1710 North 50th Avenue, Hollywood, FL 33021, tape $24.95, disk $29.95 plus $1.50 S/H)

— Jerry Semones

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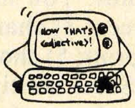

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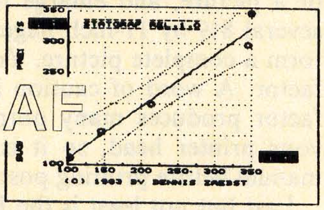

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HARDCOPY

A Five-Star Choice For A Printer Utility

By Larry Birkenfeld

Having a hard time getting that beautifully artistic creation off the disk and into a more tangible form for others to admire? Never fear, *HARDCOPY* is here. It is such a great printer utility it will make you want to hire an artist just to create pictures to print. *HARDCOPY* was written by Eric White and Scott Smith and is distributed by Computize, Inc.

HARDCOPY requires a 64K CoCo or CoCo 2, one disk drive and a printer to match the version you buy. At the time of this writing, the only printers supported are the Epson MX-80/100, RX-80 and FX-80, the I.D.S. 560-G and the Okidata 92. Support for other printers is supposedly on the way. Since each version supports only one printer, you must be sure to order the one that matches your printer. I reviewed the MX-80 version and it ran like a dream. Needless to say, I was very impressed.

The package comes with a single diskette and a nicely printed 27-page manual. The manual is well-organized, nicely illustrated (by *HARDCOPY* no doubt) and is quite sufficient.

HARDCOPY itself is capable of using four disks. They are 1) the *HARDCOPY* disk, 2) *Graphicom Part II* user fonts, 3) *Graphicom* format picture disks and 4) any disk containing a Hi-Res picture in binary format, including those saved from *CoCo Max* using the *SCREEN.BIN* file. I tested using the sample files on the *HARDCOPY* disk and a small picture made with *Graphicom*; all worked fine. Each picture processed is 6144 bytes long. The manual states that only 6144 byte images from *CoCo Max* can be processed, however, Bruce, at Computize, has informed me that this is no longer true. If you have *CoCo Max* and are interested in *HARDCOPY*, you might discuss this with him.

Before booting the program there are three parameters in the boot file that may be changed if you so desire. The parameters and their default settings are as follows:

1) Self-centering or non self-centering joysticks: default, self-centering.
2) Printer Baud rate: default, 9600 Baud.
3) Character set: default, ASCII/SET (*Graphicom Part II* fonts may be used).

After booting you will be requested to press Reset until the screen corner appears red. After this, pressing any key will bring up the main menu. At this point, pressing the space bar selects the keyboard as the main input device, while pressing the joystick firebutton selects the joystick as the main input device. Once selected, the input device may be changed while on any menu screen by pressing either the space bar or the joystick firebutton.

Once the main menu has appeared you see eight possible choices:

1) 1 x 1 print (¼ page)
2) 2 x 2 print (½ page)
3) 3 x 3 print (full page)
4) Label print
5) Card Shop
6) Poster
7) Special Effects
8) Disk Access

Each selection is represented by a picture on the screen. Your choice is made by placing a movable square around the picture representing the desired option and pressing the firebutton (I selected the joystick as my input device for this review).

The first three main menu options produce identical submenus. You may 1) return to main menu; 2) look at the screen; 3) change `PMODE`; 4) select color or black-and-white print; 5) choose a positive print; 6) choose a negative print. Since multiple printer dots are required to provide shades of gray for color prints, the color option is not functional on a 1 x 1 print.

The Special Effects option lets you define two shades of gray, rotate your print, choose only a portion of a picture to print by using a variable window, change the size of a pixel in the 'x' and/or 'y' direction, adjust the space between pixels, make the space between pixels either black or white, and produce mirror images. If all this doesn't impress you, nothing will. These features make *HARDCOPY* a very versatile printer utility.

The Label print option has all the features of the first three options. The "color or B & W" feature has been replaced with a "# of labels" feature. Once a print type is selected, a label size window appears over the picture for you to select which portion of the picture to print on the label.

The Card Shop option lets you take a picture, add text above or below it (you choose the text size), create text for the inside of the card and print all of this on one sheet of paper in such a fashion so as to be able to fold the sheet into a greeting card, complete with your picture and text.

The Poster option allows you to take a picture, or part of a picture, and enlarge it into a poster. It is made of several 8½ by 11-inch pages and must be put together to form a complete picture. You may choose your own scale factor. A word of caution is in order here: A large scale factor produces many output pages. This may overheat your printer head, so it is best to consult your printer manual before printing posters.

Last but not least is the Disk Access option. Naturally, this allows you to load the picture you wish to work with. You may also view a directory or view each picture on the disk one at a time.

For those who would like to print pictures from your own BASIC routines, *HARDCOPY* provides a "usercall" file and complete instructions for passing all required parameters through the BASIC routine to the usercall routine.

HARDCOPY is an excellent product that gives excellent results. If you're looking for a printer utility, it is a five-star choice.

(Computize, P.O. Box 207, Langhorne, PA 19047, disk $29.95)

Color Computer Machine Monitor Gets The Job Done

Serious programming in assembly language requires a good editor/assembler, a monitor, possibly a disassembler and other software devices. Minor patching or debugging of assembler programs requires only a monitor, which is a machine language program to observe (or "monitor") changes in RAM caused by the assembler program one is debugging.

The standard for assembler-support software programs is Radio Shack's *EDTASM+* because not only is it easily available and low in price, but it is the most frequently used assembler for CoCo ML programs. Considering that a monitor program represents only a portion of the *EDTASM+* package, this implies that a monitor program, to be competitive, must sell for about 40 percent of the *EDTASM+* price and ought to be more user friendly. RCI's *Color Computer Machine Monitor* (or *CCMM* for short) easily meets these requirements.

What must one have in a monitor? To begin with, its primary purpose is to observe the contents of both RAM and the CPU registers as the values vary during program operation. The monitor must be capable of conveniently inserting break points into the ML program being debugged, and displaying the values of memory and registers when these break points are encountered.

The ability to remove the break points is as important as the ability to set them. One must be able to begin execution at any location (to simulate unusual entries or unexpected branching) and also limit execution to a short enough series of commands for the user to understand what happened. In addition, the ability to list the data to a printer must be present.

A good monitor must also include a FILL command. This is used to load large pieces of memory with a user-defined hexadecimal value whose change will be readily apparent. A COPY or MOVE command must be available to relocate subroutines. All of the commands should ideally be single keystroke and the monitor must be written in relocatable code so it can be loaded where it will not interfere with the program being debugged. Other features are nice, but these mentioned are the "bare bones" monitor requirements. RCI's *CCMM* includes all these monitor options.

Ideally, the monitor should be small (so as to leave a lot of memory for the programs being worked on) and be self-protective. RCI's monitor comes in two versions in one package and is small enough that it might even work in the older 4K models. The documentation is not too clear on whether 4K operation is feasible, but this program will work properly in 16K models that do not have Extended Color BASIC. That point may be very important to some users.

Unfortunately, the RCI monitor got poor marks from me on self-protection; I could crash it quite easily and it usually required a cold start (with loss of the program under development) to get going again. In addition, the keyboard sensitivity with *CCMM* running changes, which made me uncomfortable. The documentation, while neatly printed, conveniently arranged and comprehensive, is unintelligible. (I'm an MIT engineer and 25-year computer user, and I often could not understand this author.)

I must give RCI's effort only a second-place rating. Still, what is user friendly to me may be the opposite to you, and *Color Computer Machine Monitor* may be well-suited for your particular assembly needs.

(Real Computers and Intelligence, P.O. Box 74, Santa Clara, CA 95050, tape $24.40, disk $26.90)

— H. Larry Elman

One-Liner Contest Winner . . .

This One-Liner demonstrates the CoCo's PLAY command by playing the theme from *Raiders of the Lost Ark*. Try a tempo value of '5' for best results.

```
0 CLS:PRINT"RAIDERS OF THE LOST
ARK THEME...":INPUT"TEMPO";I:PL$
="O2T=I;L4GG#A#O3L2D#O2L3.FGL2G#
":PA$="P255L4O2B-O3CDL2G#P255L4.
O3CP255DP255D#P255P255FP100L2G":
PY$="O2L5B-B-B-O3L4GFO2L5B-B-B-O
3L4GL2FP100O1L9E-O3E-O4E-O5E-":P
LAYPL$+PA$:PLAYPL$+PY$:GOTO
```

Donny Schiavone
Tulsa, OK

(For this winning one-liner entry, the author has been sent copies of *The Rainbow Book Of Simulations* and its companion *Rainbow Simulations Tape*.)

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OS-9 Hi-Res Screen Dump Utilities For Quality Printouts

Tandy has released a new product in the OS-9 line, a Hi-Res screen dump package called *OS-9 Hi-Res Screen Dump Utilities.* The programs come neatly packaged in a 7 by 11-inch book-like container including the instruction booklet, program diskette and software registration information. This information will allow the owner to receive updates to the programs. Enclosed with the registration card is a software version log to help avoid any confusion with later patches or problems.

OS-9 Hi-Res Screen Dump Utilities comes in two versions, both requiring 64K. One for Tandy (or compatible) dot matrix printers and the other for the ink-jet printer and its color capability. These programs will allow the user several options, the first of which is to print whatever is on the graphics screen to the printer. This mode has several options I will discuss later.

It is also possible to print a picture file to the printer. The third mode is one I found rather interesting. It will allow the graphics screen or picture file to be sent to disk. This is not so great in itself, but all it takes to print the file later is to `LIST <pathname> >/p`. Why is this so great you ask? If the picture has been dumped to the disk in this manner, it will be much easier to make multiple printouts of it.

Each of the programs has its own set of options to allow the user to customize the dump. The black-and-white program has three options: 'I', 'C' and '7'. Very simply, these stand for Inverse (swap black and white), Condensed and LP VII(7) mode. If the LP VII or DMP-100 is used, the '7' option must be used to accommodate those printers. Also, the Condensed mode will not work on either of these two printers.

The color dump program has 10 different options, each specifying a different color set. The first six determine which set of four colors are to be used and the last four are for setting the two-color modes. When using the two-color modes, the horizontal resolution is 256; the four-color modes each have a horizontal resolution of 128. The two-color modes consist of combinations of black, white and green, while each of the four-color modes consist of combinations of the colors available in Extended Color BASIC.

These utility programs are very well-packaged, sufficiently documented and extremely easy to use. The disk is not in any way protected which allows easy backups for archival purposes. One thing I would like to have seen in the documentation is a procedure that could be used to save a section of graphics memory to a picture file.

A drawback to these programs is that if the user has the Hi-Res (*O*PAK*) program installed and calls up either of the programs to dump that screen, the screen is cleared and the program's logo is printed on the screen. This results in loss of the information on the Hi-Res screen and print out of the screen dump program's banner — a major problem. The only way around that is to save the screen to disk and then print it in that manner, which once again demonstrates the need for a discussion of saving graphics screens to disk.

If you use the Hi-Res graphics capabilities of OS-9 and wish to have a printout of your Hi-Res screens, I would highly recommend this package to you.

(Radio Shack stores nationwide, 64K OS-9, disk $14.95)

— Mark Anderson

One-Liner Contest Winner . . .

Dotbounce shows a dot bouncing around the screen. When it hits the edge of the active screen area, you'll hear a random tone; the dot will change direction and speed randomly.

The listing:

```
0 CLS0:W=1:Z=1:X=0:Y=0:PLAY"L80"
:FORA=1TO2STEP0:IFX+W>63THENW=-1
-W:PLAY"O3C":NEXTA:ELSEIFX+W<0TH
ENW=-1-W:PLAY"O3E":NEXTA:ELSEIFY
+Z>31THENZ=-1-Z:PLAY"O3G":NEXTA:
ELSEIFY+Z<0THENZ=-1-Z:PLAY"O4C":
NEXTA:ELSESET(X+W,Y+Z,5):RESET(X
,Y):X=X+W:Y=Y+Z:NEXTA
```

Steven Ostrom
Minnetonka, MN

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Simulations* and its companion *Rainbow Simulations Tape.*)

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by CHERRYSoft

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Software Review

Professor Pressnote's Music Machine Makes Perfect Practice

Anyone who has gone through the experience of music training with their children on an instrument can appreciate a program that makes note recognition a lot simpler.

Not only are the fundamentals of music-making made easier by *Professor Pressnote's Music Machine*, but this new program distributed by Tandy makes those early lessons in music appreciation twice as fun.

The program was designed for use with a 32K system (tape or disk) with Extended BASIC, and a TRS-80 Electronic Book that makes interaction with the computer simple. You will have to purchase the Electronic Book separately, but it works with a series of learning programs for CoCo.

A clearly written 50-page user's guide describes in detail all of the six learning activities, how to use the Electronic Book, and provides a step-by-step demonstration for each of the activities, which consist of:

— Play A Tune, which displays a musical staff with the notes of the C scale and plays three familiar tunes.

— Note-Finder, which helps the learner become familiar with the notes of the C scale by showing their names and their positions on the musical staff.

— Length-Maker, which presents the concept of note values by letting the child write short tunes using notes of different pitches and lengths.

— Tone Machine, which allows the student to play live music, either by reading from sheet music or by composing original tunes.

— Copy A Tune, which lets the learner enter the notes of a tune that is copied or created, then play it back.

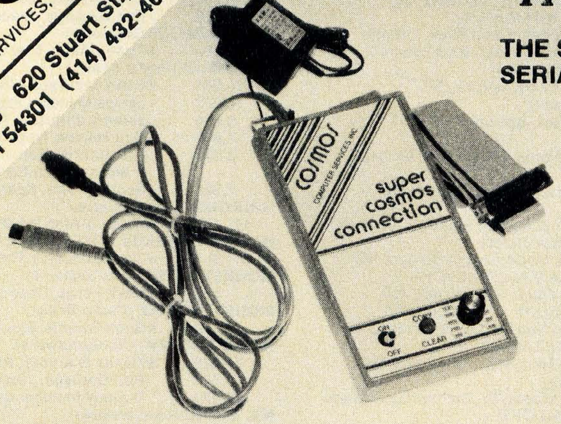
— Quizzes consists of "Name The Notes," which tests the student's understanding of the locations and names of different notes on a musical staff, and "Add The Lengths," which tests understanding of the length values of notes.

The package is complete with pages that you simply insert into the Electronic Book. The book plugs into the right joystick port; no special adaptors or connectors are required. The child enters commands simply by pressing marked areas on the pages of the book instead of the keyboard.

As noted earlier, *Professor Pressnote's Music Machine* is a fun experience. But I would suggest or caution that it is only for families who are serious about music education — primarily because of the expense involved in two separate purchases, and you should also be prepared for hours of serious study. Don't expect to sit down and start playing such traditional children's favorites as "Mary Had A Little Lamb" or "Twinkle, Twinkle Little Star" right away.

(Radio Shack stores nationwide, $24.95, Electronic Book $24.95)

— Charles Springer



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51,700	★William Hearne, Decatur, AL
41,725	Erik Habres, Bordentown, NJ
35,600	Chris Morris, Colonial Heights, VA
18,300	Baiju Shah, Deep River, Ontario
ATOM *(Radio Shack)*	
53	★Alan Drazen, Longwood, FL
41	Erik Huffman, Rochester, MI
BASEBALL *(Radio Shack)*	
525-50	★Bob Dewitt, Blue Island, IL
BATS AND BUGS (THE RAINBOW)	
24,600	★Michael Rosenberg, Prestonburg, KY
BEAM RIDER *(Spectral Associates)*	
577,330	★Bart Lyon, Queensland, Australia
51,210	Tim Hart, Salt Lake City, UT
BLACKBEARD'S ISLAND *(NOVASOFT)*	
79	★Jeff Roberg, Winfield, KS
BLACKJAK (THE RAINBOW)	
$10,000	★Wayne Dewitt, Blue Island, IL
BLACK SANCTUM *(Mark Data)*	
115	★Bette Hatcher, Norwalk, CA
BLOC HEAD *(Computerware)*	
186,700	★Pierre-Jean Douillard, Granby, Quebec
41,975	Michael Hebb, Victoria, Australia
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279,600	★Alan Drazen, Longwood, FL
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78,100	Steve Leonard, Roselle Park, NJ
60,925	David Hart, Salt Lake City, UT
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15,520	★Brett DuPont, Oregon, OH
BUZZARD BAIT *(Tom Mix)*	
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CALIXTO ISLAND *(Mark Data)*	
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135	Bette Hatcher, Norwalk, CA
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158,500	Scott Bellman, Davenport, IA
148,400	Brett Fancher, Hooksett, NH
143,200	Sara Beighley, Schofield, WI
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1,535	Pierre-Jean Douillard, Granby, Quebec
1,245	Sean Conner, Summit, NJ
1,213	Doug Schwartz, Glendale, AZ
1,036	Steve Black, Palmdale, CA
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104,200	★Blossom Mayor, East Greenbush, NY
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COLOR BASEBALL *(Radio Shack)*	
105-0	★Francis Yu, Calgary, Alberta
86-1	Brian Bruen, Cortland, NY
COLOR CAR *(NOVASOFT)*	
525,650	★Dan Bouges, Niantic, CT
229,715	Jerry Falicki, Grand Rapids, MI
163,032	Frank Canepa III, Santurce, Puerto Rico
154,600	Scott Cunningham, East Lyme, CT
COLORPEDE *(Intracolor)*	
3,107,194	★John Ray, Goodlettsville, TN
COSMIC INVADERS *(Spectral Associates)*	
16,400	★Mariano Frausto, Blue Island, IL
5,960	Derek Potter, Deep River, Ontario
CRYSTLE CASTLES *(ThunderVision)*	
545,000	★Jay Roberg, Winfield, KS
532,000	Eric Roberg, Winfield, KS
527,155	Chris Cope, Central, SC
101,476	Daniel D'Amour, Pincourt, Quebec
83,297	Craig Hoffmann, Kenosha, WI
CU*BER *(Tom Mix)*	
19,550	★Rodney Mullineaux, Gig Harbor, WA
DALLAS QUEST *(Radio Shack)*	
93	★Robert Sunderland, Sacramento, CA
96	Erik Huffman, Rochester, MI
DEFENSE *(Spectral Associates)*	
56,720	★Brett DuPont, Oregon, OH
DEMON II (THE RAINBOW)	
21,925	★Keith Schuler, Merritt Island, FL
DEVIL ASSAULT *(Tom Mix)*	
64,741	★Eugene Little, Pierceland, Saskatchewan
DOODLEBUG *(Computerware)*	
825,370	★Susan Ballinger, Uxbridge, Ontario
DOUBLE BACK *(Radio Shack)*	
614,450	★Eugene Roosa, Stone Ridge, NY
DOWNLAND *(Radio Shack)*	
20,900,400	★Adam Petersen, Portland, OR
68,345	Alain Cyr, Valcourt, Quebec
67,456	Chris Mitchell, Byron, GA
67,141	Cliff Farmer, McGregor, TX
66,145	Jeanine McCuen, Rutland, MA
16,951	David Hart, Salt Lake City, UT
DRACONIAN *(Tom Mix)*	
628,470	★Jeff Coladonato, Roslyn, PA
DRAGON FIRE *(Radio Shack)*	
1,520	★Bette Hatcher, Norwalk, CA
DUNKEY-MUNKEY *(Intellectronics)*	
16,500	★Baiju Shah, Deep River, Ontario
11,000	Mariano Frausto, Blue Island, IL
FOODWAR *(Arcade Animation)*	
165,960	★Chris Cope, Central, SC
FOOTBALL *(Radio Shack)*	
266-0	★Tim Hart, Salt Lake City, UT
THE FROG *(Tom Mix)*	
11,080	★Mark Ferris, Deep River, Ontario
FROGGER *(Cornsoft)*	
15,860	★Erik Huffman, Rochester, MI
FURY *(MichTron)*	
172,300	★Daniel D'Amour, Pincourt, Quebec
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1,306,640	★Jackie Maddox, Iron Station, NC
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214,920	Tony Smith, Gig Harbor, WA
204,820	Arnold Snitser, Los Angeles, CA
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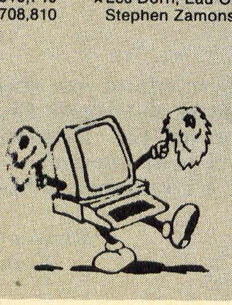
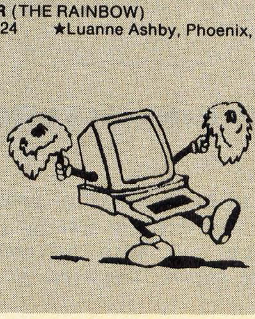
37,000	★Scott Perkins, Port Orange, FL
THE JUNGLE (THE RAINBOW)	
668,690,000	★Jeff Lawrence, Cambridge, Ontario
JUNIOR'S REVENGE *(Computerware)*	
1,072,600	★Matthew Ramsay, Detroit, MI
JUNKFOOD (THE RAINBOW)	
1,187,520	★Larry Thomson, Menominee, MI
KATERPILLAR II *(Tom Mix)*	
156,317	★Uwe Steingens, Essen, West Germany
135,467	Thomas Tiggelbeck, Essen, West Germany
97,735	Sabine Bergholz, Essen, West Germany
6,009	Manoj Hippola, Deep River, Ontario
KEY BOMBER (THE RAINBOW)	
29,052	★Tony Boring, Armagh, PA
KEYS OF THE WIZARD *(Spectral Associates)*	
662	★John Fulton, Boydton, VA
THE KING *(Tom Mix)*	
1,670,900	★Yolanda Farr, Sayre, PA
KING TUT *(Tom Mix)*	
138,500	★Martin Culver, San Francisco, CA
KLENDATHU *(Radio Shack)*	
1,177,550	★Dan Franzen, Westlake, OH
KRON *(Oregon Color Computers)*	
33,000	★Chris Cope, Central, SC
LANCER *(Spectral Associates)*	
663,000	★Jay Roberg, Winfield, KS
312,000	Eric Roberg, Winfield, KS
259,000	Kevin Roberg, Winfield, KS
LASERWORM & FIREFLY (THE RAINBOW)	
38,380	★Brian Voges, Jasper, IN
LUNAR-ROVER PATROL *(Spectral Associates)*	
136,700	★Lori Day, Arlington, TX
MADNESS & THE MINOTAUR *(Radio Shack)*	
240	★Chris Mitchell, Byron, GA
MARATHON (THE RAINBOW)	
307,790	★James Sheedy III, Tonawanda, NY
306,680	Eric Gjovaag, Bainbridge Is., WA
189,683	Eric Gadlage, Jasper, IN
MAZELAND *(Chromasette)*	
21,060	★Todd Knapp, Prairie du Chien, WI
MEGA-BUG *(Radio Shack)*	
10,661	★Blain Jamieson, Kingston, Ontario
10,223	James Mancari, Ravenswood, WV
8,054	Jeremy Johnson, Nokomis, FL
7,930	Ron Haines, Nepean, Ontario
3,998	Christopher Romance, Massapequa Park, NY
2,925	Scott Swedis, Spencer, MA
MICROBES *(Radio Shack)*	
491,100	★David & Alan Heckler, Hartselle, AL
MISSILE BARRAGE (THE RAINBOW)	
2-1	★Joe Calcaterra, Ridgewood, NY
MONKEY KONG *(Med Systems)*	
365	★Mark Ferris, Deep River, Ontario
MONSTER MAZE *(Radio Shack)*	
10,740	★Scott Swedis, Spencer, MA
MOON HOPPER *(Computerware)*	
79,830	★Daniel D'Amour, Pincourt, Quebec
73,550	Eric Gadlage, Jasper, IN
60,280	Rodney Mullineaux, Gig Harbor, WA
MR. DIG *(Computerware)*	
6,787,000	★Jeff Roberg, Winfield, KS
3,503,000	Gary Mohnsen, Tucson, AZ
3,259,750	Ellen Ballinger, Uxbridge, Ontario
3,100,650	Biagio Di Lorenzo, Montreal, Quebec
3,001,100	Ross & Daniel Mehlman, Todd Boehm, Nashville, TN
MUDPIES *(MichTron)*	
981,700	★Jon Blow, San Diego, CA
NINJA WARRIOR *(Programmer's Guild)*	
28,800	★Dave Iverson, Oakville, Ontario
OUTHOUSE *(MichTron)*	
172,270	★Matt Johnson, Eagle, PA
PAC 'EM (THE RAINBOW)	
575	★Greg Lewis, North Augusta, SC
PAC-TAC *(Computerware)*	
120,050	★Matt Johnson, Eagle, PA
32,815	Maria Cawood, Houston, TX
17,910	Greg Lewis, North Augusta, SC

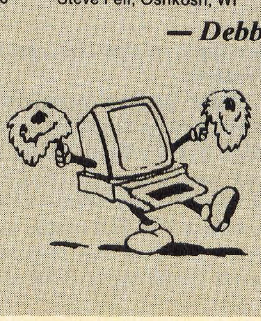
SCOREBOARD

PENGUIN (THE RAINBOW)	
48,250	★Paul Wagorn, Carp, Ontario
39,250	Kirby Smith, York, PA
22,670	Gary Bedford, Piqua, OH
16,450	Nick Kessel, Appleton, WI
14,550	Matt Funk, Hanover, PA
PHANTOM SLAYER *(Med Systems)*	
1,326	★Susan Ballinger, Uxbridge, Ontario
208	Greg Lewis, North Augusta, SC
124	Chris Morris, Colonial Heights, VA
PINBALL *(Radio Shack)*	
4,370,000	★Christopher Ward, Burlington, IA
330,050	Brad Houlden, Kenora, Ontario
PIPELINE (THE RAINBOW)	
2,829	★Mike Garozzo, Morrisville, PA
PLANET INVASION *(Spectral Associates)*	
15,700	★Manoj Hippola, Deep River, Ontario
POLTERGEIST *(Radio Shack)*	
6,000	★Billy Fairfull, Charleston, SC
POOYAN *(Datasoft)*	
3,785,000	★Ben Collins, Clemson, SC
1,546,000	Jeff Connell, Winona, MN
1,433,000	Rupert Young, Sheffield, MA
1,250,350	Richard Hawkins, Cleveland, TN
978,450	Christopher Romance, Massapequa Park, NY
99,950	Denise Abbott, Hutchinson, KS
POPCORN *(Radio Shack)*	
45,210	★Mike Norris, Columbia, SC
41,910	Nicole Freedman, Wellesley, MA
36,500	Barry Stanton, North East, PA
34,900	William Blaine III, Gallipolis Ferry, WV
32,430	Chris Bosl, Temple, TX
29,380	Dale Cote, Courtenay, British Columbia
27,280	Keri Cote, Courtenay, British Columbia
26,060	Scott Swedis, Spencer, MA
PROJECT NEBULA *(Radio Shack)*	
2,750	★Jeff Murphy, Lake City, GA
2,005	Christopher Romance, Massapequa Park, NY
545	Jeremy Brosius, Sand Springs, OK
255	Richard Young, Mesa, AZ
PYRAMID *(Radio Shack)*	
220/112	★Byll Adams, Pasadena, TX
220/112	★George Fairfield, Victoria, British Columbia
220/112	★David Oelhaupl, Calgary, Alberta
220/112	★Robbie Sablotny, Mt. Zion, IL
220/113	John Fulton, Boydton, VA
220/114	Chris Mitchell, Byron, GA
220/140	Bette Hatcher, Norwalk, CA
220/237	James Mancari, Ravenswood, WV
Q-NERD (THE RAINBOW)	
1,958,950	★Bruce Baltzer, Hanover, Ontario
QUIX *(Tom Mix)*	
907,320	★Andrew Norrie, Mississauga, Ontario
RAAKA-TU *(Radio Shack)*	
50	★Ryan Devlin, Louisville, KY
50	★John Fulton, Boydton, VA
50	★Todd Knapp, Prairie du Chien, WI
50	★Robbie Sablotny, Mt. Zion, IL
40	Robbie Haines, Nepean, Ontario
40	John Perepchuk, Blairstown, NJ
RACER (THE RAINBOW)	
174.9	★Kirby Smith, York, PA
RADIO BALL *(Radio Shack)*	
4,510,740	★Les Dorn, Eau Claire, WI
3,708,810	Stephen Zamonski, Ewing, NJ
1,985,350	Nick Kessel, Appleton, WI
1,738,150	Mickey Emberton, Indianapolis, IN
1,629,200	Benoit Lareau, Montreal, Quebec
1,097,750	Paul Vandenberg, Appleton, WI
REACTOIDS *(Radio Shack)*	
5,257,295	★Gary Bedford, Piqua, OH
RETURN OF THE JET-I *(ThunderVision)*	
538,432	★Matt Griffiths, Stilwell, KS
429,160	Jean-Francois Bruneau, St-Hubert, Quebec
300,001	Cory McKay, Montreal, Quebec
203,500	Jamey Maumus, New Orleans, LA
REVERSE (THE RAINBOW)	
7	★Jon Hobson, Plainfield, WI
ROAD RACE (THE RAINBOW)	
91.7	★Bill Martin, Myrtle Beach, SC
447.7	Rupert Young, Sheffield, MA
576.6	Eric Clarkson, Missouri City, TX
706.1	Michael Hebb, Victoria, Australia
1212.4	Michael Martens, Wausau, WI
ROBOTRON *(Intracolor)*	
335,400	★Baiju Shah & Mark Ferris, Deep River, Ontario
ROBOTTACK *(Intracolor)*	
36,090	★Hiram Esparza, Blue Island, IL
RUN FOR YOUR LIFE (THE RAINBOW)	
20,000	★Ryan Devlin, Louisville, KY
SAILOR MAN *(Tom Mix)*	
879,100	★Alan Drazen, Longwood, FL
699,600	Matthew Ramsay, Detroit, MI
643,700	Ruth King, Mississauga, Ontario
602,800	Aaron Samuels, Monument, CO
596,700	Jeff Picketts, Brantford, Ontario
299,000	Dan Sobczak, Mesa, AZ
238,600	Dave Iverson, Oakville, Ontario
SANDS OF EGYPT *(Radio Shack)*	
77	★Jeff Hillison, Blacksburg, VA
80	John Allocca, Yonkers, NY
80	Bob Dewitt, Blue Island, IL
82	Jeff McKay, Travis AFB, CA
87	PJ Jayakody, Shelbyville, TN
110	Nolan Edward Lee, Sun, LA
SCARFMAN *(Cornsoft)*	
545,700	★Matthew Ramsay, Detroit, MI
SEA DRAGON *(Adventure International)*	
39,030	★Brian Wolfgram, Freeland, MI
SEASTALKER *(Infocom)*	
212/90	★Jeff Hillison, Blacksburg, VA
SHAMUS *(Radio Shack)*	
62,940	★Jon Blow, San Diego, CA
56,860	John Lake, Princeton, IL
27,950	Erik Huffman, Rochester, MI
SHENANIGANS *(Mark Data)*	
95	★Jeff Hillison, Blacksburg, VA
95	★David Kay, Winnipeg, Manitoba
96	N. Wakelin, Mt. Lebanon, PA
103	Chris Cope, Central, SC
SHOOTING GALLERY *(Radio Shack)*	
227,840	★Cliff Farmer, McGregor, TX
24,000	Bob Dewitt, Blue Island, IL
20,880	David Hart, Salt Lake City, UT
SKIING *(Radio Shack)*	
01:00	★Scott Clevenger, Fairmount, IN
01:00	★Billy Fairfull, Charleston, SC
SKRAMBLE *(Tom Mix)*	
80,020	★Brad Houlden, Kenora, Ontario
SLAY THE NERIUS *(Radio Shack)*	
472,667	★Jim Herbers, Placentia, CA
SNAKER (THE RAINBOW)	
1:24	★Luanne Ashby, Phoenix, AZ
SOLO POKER *(Datasoft)*	
1,100	★Carol Staker, Moscow, ID
710	Erik Huffman, Rochester, MI
690	Robert Peterman Jr., Newton, TX
SPACE AMBUSH *(Computerware)*	
29,480	★Frank Canepa III, Santurce, Puerto Rico
SPACE ASSAULT *(Radio Shack)*	
19,065	★Steven Allen, Sharpsburg, MD
6,590	Manish Shah, Harrow, England
SPACE RACE *(Spectral Associates)*	
83,422	★Mark Donahue, Alexandria, VA
SPEED RACER *(MichTron)*	
126,750	★Jack Manzullo, Saginaw, MI
STARSHIP CHAMELEON *(Computerware)*	
68,800	★Brian Voges, Jasper, IN
STELLAR LIFE-LINE *(Radio Shack)*	
119,030	★Brian Shaber, Boise, ID
STORM ARROWS *(Spectral Associates)*	
263,850	★Arnold Snitser, Los Angeles, CA
TEMPLE OF ROM *(Radio Shack)*	
959,400	★Sonya Hurst, Richmond, CA
889,400	Karl Gulliford, Ladson, SC
837,600	David Oelhaupl, Calgary, Alberta
620,800	Rhea Jarrard, Olympia, WA
463,400	Glenn Alfrey, Olympia, WA
306,400	Michael Wensing, Berwyn, PA
234,000	Robin Nicholson I, El Paso, TX
TIME BANDIT *(MichTron)*	
1,025,210	★Terry Moore, St. Catherines, Ontario
747,460	Steven Coladonato, Roslyn, PA
359,980	Kristopher Staller, Ft. Wayne, IN
88,940	Brian Wagner, Lawrence, KS
71,430	Rupert Young, Sheffield, MA
28,840	Brad Houlden, Kenora, Ontario
THE TOUCHSTONE *(Tom Mix)*	
226,640	★Kristopher Staller. Ft. Wayne, IN
TRAILIN' TAIL (THE RAINBOW)	
273,390	★Jerry Dill, Grafton, MA
TRAPFALL *(Tom Mix)*	
80,116	★Kenneth Merkel, Houston, TX
59,080	Connie Bird, Ooltewah, TN
50,078	Lori Day, Arlington, TX
TUBE FRENZY *(Aardvark)*	
140,280	★Becky Baker, Marissa, IL
TUT'S TOMB *(Mark Data)*	
189,960	★Nicole Pouliot Coors, Mobile, AL
WHIRLEYBIRD RUN *(Spectral Associates)*	
54,500	★Jay Aust, Marlborough, CT
43,850	Glen Bilodeau, Otterburn Park, Ontario
43,350	PJ Jayakody, Shelbyville, TN
30,100	Dan Durga, Flint, MI
27,300	Michel Lebrun, Anjou, Quebec
WILDCATTING *(Radio Shack)*	
$30,193,000	★Gary Mohnsen, Tucson, AZ
WILLY'S WAREHOUSE *(Intracolor)*	
183,500	★Alan Morris, Chicopee, MA
ZAXXON *(Datasoft)*	
2,068,900	★Dave Levora, Oak Forest, IL
2,057,800	Chris Oberholtzer, Lexington, MA
1,700,000	Biagio Di Lorenzo, Montreal, Quebec
1,510,000	James Quadrella, Brooklyn, NY
850,500	Eric Gadlage, Jasper, IN
123,200	James Mancari, Ravenswood, WV
104,700	Douglas Ervine, Burlington, IA
89,000	Cory McKay, Montreal, Quebec
82,600	Steve Black, Palmdale, CA
48,900	Steve Fell, Oshkosh, WI

— Debbie Hartley







SCOREBOARD POINTERS

In conjunction with THE RAINBOW's Scoreboard, we offer this column of pointers for our game-playing readers' benefit. If you have some interesting hints and tips, we encourage you to share them by sending them to the Scoreboard, c/o THE RAINBOW.

CAN'T GET NO SATISFACTION

Scoreboard:

Do you think you can increase the amount of "Scoreboard Pointers," giving a wider variety of help?

Also, how about having more "Scoreboard" records?

Thanks a lot.

Mike Rebbecchi
Somerdale, NJ

Editor's Note: The more pointers we get, Mike, the more we're likely to print. C'mon, Scoreboarders, share those secrets.

POPPING THE RIVETS

Scoreboard:

For those having trouble "popping the rivets" on *The King*, here's a trick to solve it. When you have popped all the rivets on the left column, get the hammer in the middle and hit as many fireballs as you can. After each fireball is hit, run to the right until the girl on top faces the right. This sends all the fireballs entering the board to the left, where they are trapped. After you hit as many as possible, run to the top right rivet. When you pop the rivet, center your joystick and press the jump button as soon as your man is going to fall. While you are falling, you're also popping the rivets.

Brian Peters
Philadelphia, PA

FRAGILE — HANDLE WITH CARE

Scoreboard:

I have a couple of tips concerning Radio Shack's *Pyramid*.

1) For those having problems setting down the vase, you must get the velvet pillow from the high priest's room. After you have that, get the vase and type `RELEASE VASE` and it is set safely on top of the velvet pillow.

2) After about 290-310 turns, your lamp starts to run out. You can prevent this by checking your score every once in a while, and by getting the extra batteries from the vending machine — if you have the gold coins.

3) There's a very quick and easy passage to the entrance of the pyramid. When you get to the area where there is a panel on the wall, type `PANEL` and you will be at the entrance of the pyramid. To get back just type `PANEL` again. This makes it easy for you to drop your treasures at the entrance without wasting your turns.

David Hart
Salt Lake City, UT

Scoreboard:

In response to Judd Rossman's letter (June 1985) concerning *Black Sanctum*, you must drop the ash (`DROP ASH`) and type in a weird message on a certain piece of paper that now might be a statue!

I need help with *Madness and the Minotaur, Sands of Egypt, Dungeons of Daggorath* and *Dallas Quest*. Any clues or suggestions would be helpful.

Steve Warrick
Peru, IL

BRIDGE THE GAP

Scoreboard:

In response to Ian Loeppky's letter (July 1985), the only thing you need the scepter for is if you want to make a bridge over the bottomless pit. You do not need the scepter for the bird! If you have the scepter while trying to get the bird, it flies away; you must first drop the scepter.

Any way you can, type `GO PANEL` where you drop the treasures and then you will be in the same hallway.

James Mancari
Ravenswood, WV

COCO GAME CLUB OFFER

Scoreboard:

I'd like to know if any of your readers would be interested in joining a "CoCo Game Club" for both Adventure and arcade-type games. There are no dues or fees. This will be mainly an information club so we can help each other solve games, as well as meeting new CoCo owners and hearing of their Adventures — through letters and possibly even phone calls.

If any of you are interested, please send one 22 cent stamp to P.O. Box 1308, 90651-1308. I think a club for CoCo game lovers would be great! Thank you.

Bette A. Hatcher
Norwalk, CA

Scoreboard:

I have solved *Calixto Island* and I have some hints. The treasure is in the clearing with the idol. Dig twice, get everything in the house and load it in the machine. When you get to the field, unload and put the stuff in the shed. The manual for the machine is in the chest. Trader Jack will only trade the keys and machete for the rug and chest. (The keys open the desk.) Give the natives the costume jewelry.

I also have a few questions. How do you read the microfilm? What's in the pottery and what are the specs for?

Charles Farris
Shinveld, the Netherlands

OLYMPIC QUEST

Scoreboard:

Is there an Olympic game on disk for the Color Computer?

Jon Sowle
Vero Beach, FL

Editor's Note: I received the following letter, Jon, several days after your letter. Read on.

Scoreboard:

I would like to inform your readers that there will soon be an Olympic Decathalon game out for the 64K Extended Color Computer. For more information send an SASE to R & A Enterprises, 48 North View Ave., 02920.

Richard Russillo
Cranston, RI

ALMOST A SOLUTION

Scoreboard:

I would like to respond to Tony Cross' letter (August 1985) concerning *Trekboer*. In the interest of "true Adventuring," I can't simply reveal the final portion of the game, but I can give a few hints.

In the underground complex on the garden planet, there is a steel grate. This grate is made of the same *metal* as the access panels of the "Trekboer" and "Veldboer."

Once past the grate, don't disregard any garbage you may find — it could *bridge* the gap between a hopeless situation and victory. Be sure, though, that you've left a *line* of escape or you may be left *dangling*.

George Caleodis
Steubenville, OH

DEFEATING THE DROIDS

Scoreboard:

I have solved *Major Istar*. For those who have this Adventure, take heart. Getting past the security droids can be frustrating, but it isn't difficult. There are two sections of security droids to run through. The second set of droids is faster than the first and their paths are slightly different.

As in other Adventure games, you will have to backtrack in order to obtain the necessary items.

Lastly, you must remember the importance of computers.

Karen L. Jessen
Cleveland, OH

Scoreboard:

In conjunction with Mike French's letter (July 1985) concerning *Dungeons of Daggorath*, instead of just putting one item in front of you, try putting a whole bunch of stuff. This way you can really get ahead of the monsters.

Chris Morris
Colonial Heights, VA

INCREASING YOUR SCORE

Scoreboard:

In *Crystle Castles* there is a way to achieve very high scores. On the first level, there is occasionally an extra door. Go in this door and jump. This will advance you several levels and give you some bonus points and an extra life. If you play long enough, you can get the bonus up extremely high (i.e., 490,000).

Jeff, Kevin, Eric and Jay Roberg
Winfield, KS

Scoreboard:

Wow! What excellent graphics *Amphibia* has, but four buggies sure go quick. Try changing the value of NS in Line 0 to a higher number for more buggies.

Jim Cockrum
Martinsville, IN

DALLAS TIPS

Scoreboard:

I have solved *Dallas Quest* and here are some hints you may find useful.

There are several objects in this Adventure that are useless. These include the apples, the rope and the suspenders.

When you get to the crossroads, go to the "Nest Egg." Remember to get the coconuts. When you get there, bribe the monkey with the tobacco and get the eggs.

After you go back to the tribe, show the monkey the mirror, and to escape from the natives `WAVE` the `RING`. When you get to the spider, type `HATCH EGGS`.

You also wave the ring to get by the elephant. To get by the lion, show him the mirror, too. I'll leave the rest of the Adventure for you to solve.

I am stumped with *Trekboer*. When I enter the underground complex I give the spider the yellow capsule. But when I get to the grating, there is another spider there! What am I supposed to do?

Keith Schuler
Merritt Island, FL

Scoreboard:

I have a tip for anybody who owns *Raaka-Tu*. When you have collected all your treasure, try to `MOVE` the `ALTAR`.

In *Madness and the Minotaur* when your lamp gets dim, find the urn and `FILL LAMP`.

In *Bedlam*, try to get the green key with the hook when you are one room away from it.

In *Dallas Quest*, use the shovel as an oar.

John Perepchuk
Blairstown, NJ

Scoreboard:

I'm having a lot of trouble staying alive in *Beyond the Cimeeon Moon*. Does anyone have hints on how to get through safely or other helpful tips?

Tex Kertesz
Mesa, AZ

Scoreboard:

In *Raaka-Tu*, everyone says "get the poisonous candle to kill the gargoyle." This may be a dumb question, but where's the poisonous candle?

Chris Allbritton
Little Rock, AR

Scoreboard:

I would like to know why the pokes for Tom Mix's *The King*, in April 1985 by Jim Mathues, and in March 1985 by Bill Bernico do not work on my game. If anyone knows why, write to "Scoreboard Pointers."

Chad Parker
Battle Creek, MI

BAREFOOTIN'

Scoreboard:

I need help on *Shenanigans*. Where do I get the shoes? I can find the clothes, but not the shoes. The bartender just kicks me out!

Mike Kennedy
Terrace Park, OH

Editor's Note: Look under the bed.

To respond to other readers' inquiries and requests for assistance, reply to Scoreboard Pointers, c/o THE RAINBOW, P.O. Box 385, Prospect, KY 40059. We will immediately forward your letter to the original respondent and, just as importantly, we'll share your reply with all Scoreboard readers in an upcoming issue.

— Debbie Hartley

CORRECTIONS

"Brotan the Blue" (August 1985, Page 18): Alan Saporta tells us there are three changes that need to be made to his program. Change lines 32 and 34 to read as follows:

```
32 PUT(S,F)-(S+8,Y+11),SP:IFSC>2
000 AND SC<2050 AND GY<10 THEN G
Y=GY+1 ELSE IF SC>5000 AND SC<5
50 AND GY<10 THENGY=GY+1

34 PUT(CD,Y)-(CD+8,Y+11),SP:IFSC
<15000 OR ED=10 THEN36 ELSE IF R
P=1 AND ED<>10 THEN GOTO35
```

Also, add `:ED=10` to the end of Line 35.

"Say 'Hello' To This Directory Helper" (August 1985, Page 69): Doug Heyza tells us that a minor bug in his program can be fixed by adding this line:

```
895 P$(N)=""
```

"The Eye Saver" (July 1985, Page 124): Norman Wong says at least one reader has had a problem in Line 80 because a space was left out. Line 80 (which is correct as shown in the magazine) should have a space between `IFSM< >K` and `THEN`.

"Operation Freedom" (August 1985, Page 54): Linda Hartman called to tell us there is a problem with lines 20000 and 20040 (shown on Page 68). The end of Line 20040, which was supposed to be at the very bottom of the left column, ended up within Line 20000 instead. Here are the two lines in their correct form:

```
20000 C$=CHR$(128):PMODE1,1:PCLS
3:SCREEN1,0:COLOR2,3:DRAW"BM0,12
0C4R4L2M8,99R66M80,120R2L4BM75,9
9E8U12H8L66G8D12F8":PAINT(36,88)
,4,4:PSET(20,180,2):DRAW"BM16,18
3C2F2R4E2M20,187G2D2BM23,190U2":
GET(16,180)-(24,190),IK:LINE(16,
180)-(24,190),PRESET,BF

20040 NEXTZ:PUT(40,111)-(50,120)
,IK:LINE(40,99)-(50,120),PSET,BF
:FORT=50TO100STEP10:PLAY"T"+STR$
(T)+"ABABABA":NEXTT:LINE(50,120)
-(40,99),PRESET,BF:NEXTX
```

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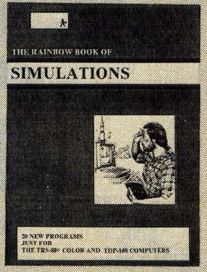
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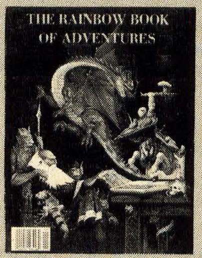

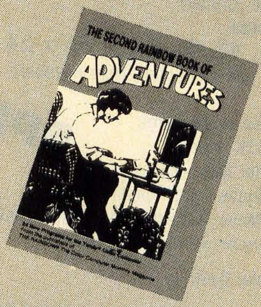

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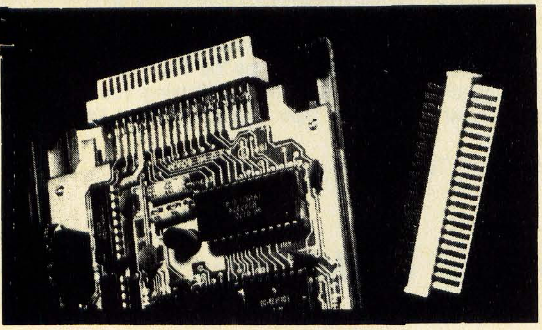

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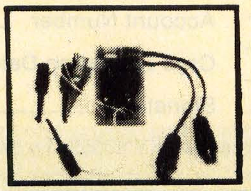

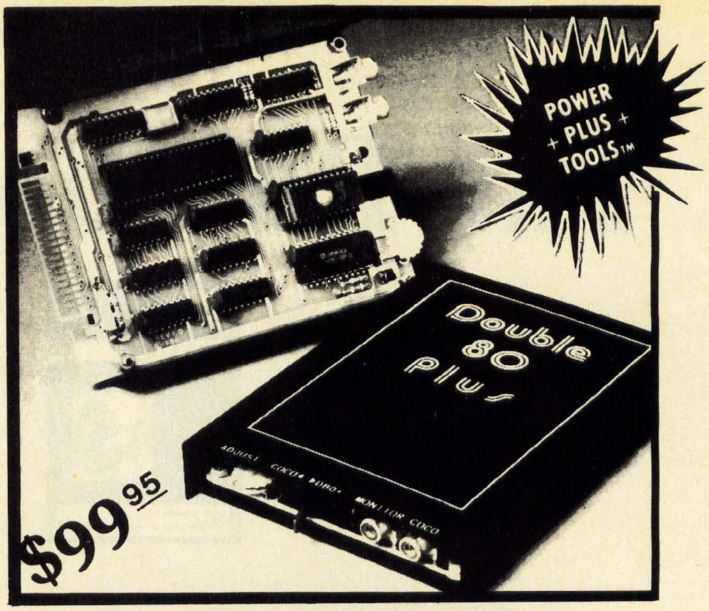

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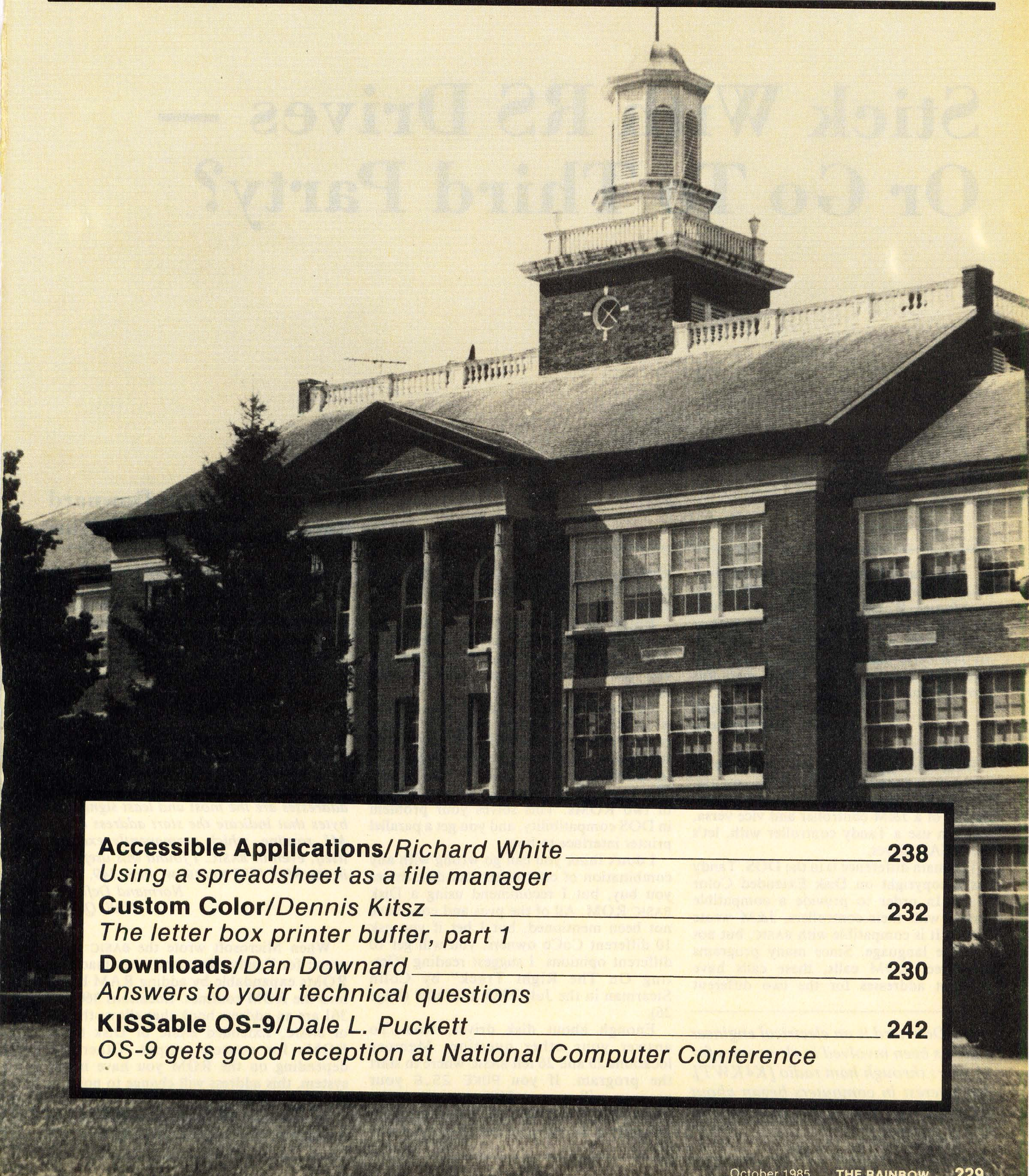

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Stick With RS Drives — Or Go To Third Party?

By Dan Downard
Rainbow Technical Editor

- *I have a 16K Extended* BASIC *CoCo 2. I hope to expand to disk and 64K in the near future. Would it be better to stick with the Radio Shack drives and DOS or buy JDOS? Also, when I* `POKE25,6: NEW` *I get my 14K back, but when I* `POKE 25,0: NEW` *I get 16K when I* `?MEM`. *Where does this extra 2K come from?*

Rod Snaith
Nipawin, Saskatchewan

Rod, the type of drives you buy is relatively independent of the DOS you use. The use of Tandy drives does not preclude the use of a J&M controller and vice versa, you can use a Tandy controller with, let's say, TEAC drives.

The main difference is in the DOS. Tandy has a copyright on Disk Extended Color BASIC. In order to provide a compatible system with their controllers, J&M wrote JDOS. It is compatible with BASIC, but not machine language. Since many programs use direct ROM calls, these calls have different addresses for the two different systems. Realistically, you have the same potential problem in choosing between Disk BASIC 1.0 and 1.1.

Enter ADOS. ADOS is actually an extension of Disk BASIC; it adds commands. These DOSs are compatible with Disk BASIC and quite a few users are sold on these systems.

As I have said before, the J&M controller is a little more reliable than the Tandy controller from an electrical and mechanical standpoint. Both serve the same purpose — to interface your CoCo to the disk drives. The latest J&M controller allows the use of two ROMs. This solves your problem in DOS compatibility, and you get a parallel printer interface to boot.

I don't think you can go wrong with any combination of controllers and disk drives you buy, but I recommend using a Disk BASIC ROM. All of the pros and cons have not been mentioned, but I bet if you ask 10 different CoCo owners, you will get 10 different opinions. I suggest reading "Getting On The Right Track" by Colin Stearman in the July 1985 RAINBOW (Page 26).

Enough about disk drives, Rod. To answer your other question: Memory locations 25 and 26 tell BASIC where to start the program. If you `POKE 25,6` your program will start at $600, just above the text screen. If you `POKE 25,0` your program will start at $0 and wipe out all of the RAM variables stored at these locations. If you don't plan on using graphics, `POKE 25,6` will give you the maximum amount of usable memory for a non-disk system.

BASIC/ML Combo

- *I would appreciate any information about the locations 360 and 361, which I use to make a nice combination between* BASIC *and machine language. These addresses are the most and least significant bytes that indicate the start address of my ML routine, which permanently executes itself, even in* BASIC. *I found this useful tip in the May 1984* RAINBOW, *Page 149.*

Normand Defayette
Hull, Quebec

When Microsoft wrote the BASIC interpreter for Tandy, Normand, they made the ROMs expandable by adding RAM hooks into the ROM routines. Locations 360 and 361 are an address hook that allows the use of BASIC, Extended BASIC or Disk BASIC ROMs for console output. Otherwise, depending on the ROM you have in the system, this address will change to point to the proper routine.

By changing this address to the start of a program, after loading the program it will

---

(Dan Downard is an electrical engineer and has been involved in electronics for 25 years through ham radio [K4KWT]. His interest in computers began about six years ago and he has built several 68XX systems.)

automatically execute. Actually, the microprocessor is going to output something to the screen, but after all, microprocessors are not as smart as the people using them, are they?

Type Trouble?

• *I am writing a program that uses disk I/O from machine language. I noticed in the December 1983 RAINBOW on Page 329, there is a ROM subroutine for the* LOADM *command at $CEE5. I have tried to use this subroutine, but I cannot get it to work. I set the filename in $94C (see Page 325 of that issue) and the file type in $957. Are there more parameters to set? What is the problem? Help!*

Also, at $C8A4 (on Page 329) it says the filename should be set into $957, which is listed as the file type, not the filename. Is this a typographical error or what? Also, $EB is to be set with the default drive number, but is listed on Page 324 as being in the middle of the PLAY *command section. Is this a typographical error, too?*

Kevin Roberts
Fairview, OK

The first thing to be clarified, Kevin, is that this address is only valid for Disk BASIC 1.0. The corresponding address for Disk BASIC 1.1 is $CFC1.

These entry points assume a LOADM command has been encountered in a BASIC line and scan the rest of the BASIC buffer for the filename, extension and offset. You don't want to use these entry points for a machine language program.

Actually, it is a little complicated to simulate the LOADM command from an ML program, as eventually the information to load the program is stored on the stack.

I suggest obtaining a copy of the September 1983 RAINBOW; Read the "Superpatch for *EDTASM+*" article by Roger Schrag. It adds a LOADM command to *EDTASM+* and gives a good example of what you want to accomplish. Sorry, we don't have any more back issues, but maybe you can borrow one from a friend.

Passing Parameters

• *We interface our Apple IIe (with serial card) to hospital lab instruments with an RS-232 port, matching the instrument transmission parameters (Baud rate, start/stop bits and parity) and manipulating the transmitted data using Applesoft BASIC control commands. For these applications, it is essential that sorting, reformatting and storing-to-disk operations on transmitted data occur under BASIC control without any operator interaction once the program is started. Are there any hardware/software products which will do the same on a CoCo? My impression is that most machine language modem software is not designed for linking to BASIC and thus would not be applicable.*

Ronald G. Haas
Marshfield, WI

You are correct, Ronald, as far as Disk BASIC is concerned. There are no provisions to allow remote data from the RS-232 port. A few remote terminal drivers have been written that allow remote input into BASIC programs, but it would be a major problem to match the instrument transmission parameters.

Nothing's impossible with the CoCo. Even though I've not seen an example, I'm sure a BASIC09 program can accomplish the task. What you are really interested in is the passing of parameters between procedures and remote I/O; both are possible with BASIC09. I would suggest using the RS-232 Communications Pak for your serial I/O. OS-9 Version 1.01 supports this device, and I think it would be a lot more reliable for your use than the standard serial I/O port.

Magical POKEs

• *While reading your department and others in THE RAINBOW, I saw many little* POKE*s here and there that make the CoCo do almost magical things. Do you know where I can get a list of some of these* POKE*s and how do the programmers find them? Also, if anyone is trying to get RAMs from Radio Shack — give up! They won't sell them because everyone is doing their own upgrade.*

One more thing. My CoCo is a 16K; can I just stick eight 64K chips for more memory or do I have to do more than that?

Doug Wright
Scarborough, Ontario

Doug, try obtaining a copy of *500 Pokes, Peeks 'N Execs*. One source is Spectrum Projects.

As far as memory upgrades are concerned, you have to do a little more than install eight memory chips, such as move a few jumpers. Most of the time, the company that sells the chips will provide the installation instructions. Check our RAINBOW ads.

Zapping Granules Back

• *I have a 64K Color Computer 2 with a disk drive, cassette recorder and a DMP-110 printer. A few days ago I was working with my CoCo with a program I made. In three consecutive days, I saved, loaded and killed the program many times. On the third day I found the computer erased about 95 percent of all the programs on the disk. The total of granules occupied, shown next to each program, is eight (there are eight programs occupying one granule each now; before, each program occupied about three to five granules each). When I asked for granules free in the disk, the computer showed me there were 40 granules free. What happened with the other 20 granules not shown? I made three backups with different disks and they all gave me the same results. Can you explain what happened with the programs? If the corrections are with a machine language program, can you give me the program? I know nothing about machine language programs.*

Carlos Santiago
Mayaquez, Puerto Rico

The problem you mention is the most common type of disk failure, Carlos. Most likely, your programs are still on the disk; you just destroyed the directory.

To restore the lost programs you must understand how the directory information is organized. This information is in the rear section of your Disk BASIC manual, but we'll summarize it.

Track 17, Sector 2 contains the granule allocation table for the entire disk. Starting with byte one, each of the first 68 bytes, one for each granule, form a table that tells Disk BASIC if any information is on that granule. By the way, the granules are numbered zero to 67 ($43). Granules that are available are noted by a $FF. If the number is less than $43, it points to the next granule in that particular file. If the number is between $C0 and $C9, this is the last granule of the file, the last number indicating the number of sectors in the last granule.

Track 17, Sector 3 is the start of the directory. Each file occupies 32 bytes, but only 16 bytes are used. The first 16 bytes indicate the following:

Bytes $0-$10	Filename and extension
Byte $11	File type
Byte $12	ASCII flag
Byte $13	First granule of the file
Byte $14-$15	Number of bytes in last sector

I would guess that you destroyed the directory information, Carlos, and the granule allocation table was left intact. That's where your missing granules are and, with a little "zapping," they can be restored.

One other necessity is a "disk zapping" program. I use VIP *ZAP*, obtainable from your local Radio Shack store by express order. The manual gives a complete description of how to zap, or restore, damaged files or directory information.

Your technical questions are welcomed. Please address them to: Downloads, THE RAINBOW, P.O. Box 385, Prospect, KY 40059. We reserve the right to publish only questions of general interest and to edit for space and clarity. Due to the large volume of mail we receive, we are unable to answer letters individually.

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CUSTOM COLOR

The Letter Box Printer Buffer

Part I

In Dennis Kitsz's premier article, he begins the first in a series on a cost-efficient way to build a printer buffer.

By Dennis Kitsz
Rainbow Contributing Editor

Quick! Raise your hand if you've heard of a 6803! No, it's not the microprocessor in the MC-10 (that's a 6803E). The 6803 is a close cousin, a microcomputer on a chip. It's the heart of a 64K printer buffer — I call it "The Letter Box" — for your Color Computer.

This is the first part of a series on building a printer buffer. I'll answer these questions: What is a buffer? Why do you need one? Why use a microprocessor for just one job? What makes the 6803 microprocessor a good choice for this job? Can the buffer perform other useful functions?

This project has been a long time in speculation. My friends often say, "You've been talking about a printer buffer for months. When will it be done?" I've told them, "I want it cheap, cheap, cheap! If I wanted it expensive, I could have it designed by next week."

What is a Buffer?

Shortly after using a computer printer, you begin to realize that — compared to the computers themselves — printers are slow mechanical devices. Even the fastest dot-matrix printers seem to take forever to print a program listing. And slow printers are . . . s-l-o-w! You can catch three innings of the World Series and do two loads of wash while waiting for inexpensive "letter quality" daisy wheels, such as Olivetti or Brother, to print a long article.

A printer buffer acts as an electronic waiting room. It's a place for information to sit after the computer sends it to be printed, and before the printer is able to look at it.

Most printers have some kind of built-in memory buffer, but it seldom holds more than one line (256 characters). Newer units offer buffers of 1,024 to 4,096 characters, but even these fill up rapidly.

Some sophisticated Color Computer setups with disk drives and high-level operating systems have so-called virtual buffers, also known as spoolers, reserved on several disk tracks. The operating system fools the computer into "printing" to the disk (spooling). The operating system later extracts the information from the disk whenever the printer needs more to print (despooling). (A box of burnt resistors to the first person who can recall the origin of the term "spool." Hint: It's an acronym.)

Those of us without the pleasure of an expanded disk system and tiny buffers in our printers need something else. The Letter Box is a smart buffer that holds a whopping 63,232 characters and plugs into the computer's printer jack. Best of all, you can build The Letter Box for under $100.

Why a Microprocessor?

A printer buffer appears to be a simple thing. You transmit a series of characters, it receives and stores them, and transmits them to the printer when necessary. So, why use a microprocessor? Partly to reduce the amount of hardware, but, better yet, for bells and whistles!

With a microprocessor (MPU) in control, you can program the buffer to act "smart" and do other things: print a test routine of all the printer's characters; stop (or not) after a designated number of text lines; stop (or not) after every form feed; stop (or not) after two carriage returns (a paragraph); create a "translation table" for a laser printer or typesetting machine; know

(Dennis Bathory Kitsz is a composer, software author and an electronic designer. His computer career began in 1977 after paying his dues as a librarian, truck driver and graphics designer.)

THE X-TEAM FOR OS-9

XTERM

XTERM is a full featured OS-9 communications program that takes full advantage of the power of OS-9. It works with the normal text screen, XSCREEN, or the Wordpak 80 column board.

XTERM is menu oriented for ease of use, it is simple to use even for the novice OS-9 user. And yet, XTERM is powerful enough for the expert OS-9 user.

Some of the features of XTERM include: full upload and download support with remote buffer operation; supports XON/XOFF protocol; 110/300/600/1200 baud, 5/6/7/8 bits, even/odd/no parity, full or half duplex; able to execute an OS-9 shell command from within XTERM.

XTERM works with a Color Computer using the standard serial interface, but also will work with a hardware serial port. Also, if you are using a hardware parallel printer port, you can print data to the printer as it is received.

XTERM $59.95

XMENU

XMENU is a system that creates a menu-driven environment for the Color Computer using OS-9. OS-9 now becomes easy-to-use with command selections made from menus. Menus are included to access OS-9 commands. An easy-to-use utility is provided that allows for the creation and maintenance of menus.

XMENU works with XSCREEN, the normal text screen, O-PAK, and the WORDPAK 80-column board.

XMENU 29.95

XSCREEN

XSCREEN creates a high resolution screen for the Color Computer using OS-9. This high resolution screen gives you 24 lines of text with 51, 64, or 85 characters per line. Characters can be either white on a black background or vice versa. Easy menu operation.

XSCREEN $19.95

XWORD

XWORD is a powerful word processing system for the Color Computer using OS-9. XWORD is feature packed with only a few features mentioned here.

Some of the editing features of XWORD include: true character oriented full screen editor; works with the normal text screen, XSCREEN, O-PAK, or WORDPAK 80 column card; full block commands with blocks displayed in inverse characters (except with normal text screen) for easy block manipulation; file size not limited to a buffer size; full find and replace commands with wildcard character; able to execute an OS-9 shell command in the middle of editing. Many, many more features, too many to mention here.

Some of the formatting features of XWORD include: proportional spacing supported; perfectly aligned hanging indents and columns, even when using proportional characters; full printer control with control of character size, emphasized, italics, overstrike, underlining (with or without spaces), super and sub-scripts; up to 10 header/footers; page numbering in decimal or Roman numerals; margins and headers can be set differently for even and odd pages; automatically reads printer initialization file to define XWORD for your printer (many included, and easy to write or modify your own). Many more features.

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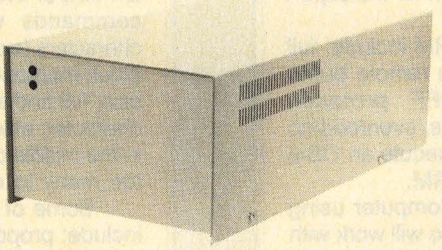

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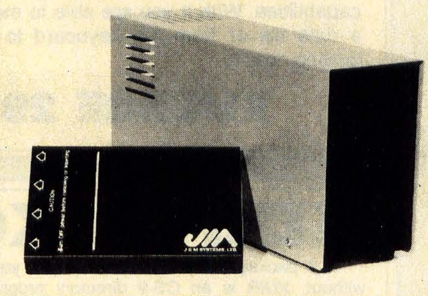

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You can use a smart printer buffer to make up for the limitations of your word processor, or to prepare nice-looking listings in BASIC or assembly language.

What Else?

As they say in those late-night TV ads, "But that's not all!" The Letter Box is actually a 64K computer that uses the versatile 6803 microcomputer. Because it has serial input and output, this device can act as the nerve center for a laboratory control system, receiving and logging data, while your Color Computer is free to perform other tasks. If you're willing, you can turn The Letter Box around and use it as a kind of modem buffer when downloading long programs or texts. You'll have to let your imagination run free.

Why the 6803?

My goal in designing The Letter Box was to stuff the greatest number of features into the smallest number of parts for the least amount of dollars. With 64K DRAM (Dynamic Random-Access Memory) prices spiraling downward, these chips were the logical choice for a large buffer. Even cheaper (free!) are 16K DRAMs pulled out of Color Computer 2s that have been upgraded to 64K.

The buffer's operating system would have to be in some kind of EPROM (Erasable, Programmable, Read-Only Memory), and some "glue chips" would be needed. (Glue chip is a clever "techie" term for those miscellaneous integrated circuits that keep a computer's processor, memory and input/output all held together.)

The biggest obstacle in building a cheap buffer is finding an inexpensive technique to perform serial input and output, the method the Color Computer uses to communicate with compatible printers. The Color Computer transmits, and printers expect to receive, a stream of characters sent at 600 Baud (bits per second). I wanted the Color Computer to quickly transmit and fill the buffer, then return to the program work. The printer could then accept information from the buffer at the usual 600 Baud pace.

My first option seemed to be to use some sort of traditional UART (Universal, Asynchronous Receiver-Transmitter) to perform the task — at least until I took a good look at the 6801/6803 microprocessor family. I got the hint by tinkering with Radio Shack's Micro Color Computer, the MC-10, which contains a 6803E microprocessor. Although the MC-10 was a marketing flop, I had always been impressed by its speed, features and the number of commands and options that had been crammed into its Microcolor BASIC operating system.

"The biggest obstacle in building a cheap buffer is finding an inexpensive technique to perform serial input and output, the method the Color Computer uses to communicate with compatible printers."

But what really caught my attention was the 6803's built-in serial input/output system. Depending on the choice of crystal frequency and the sequence of internal commands, the 6803 can be made to transmit and receive serial data at 150, 300, 600, 1200, 4800, 9600, 38400 and 76800 Baud.

Since the 6803 cost less than $10, my solution seemed at hand — almost. Some questions remained: Could the 6803 switch between Bauds (say, between 600 and 4800) "on the fly"? Could the 6803 be set up to perform the memory refresh necessary for DRAMs? If it could refresh DRAMs, would the number of glue chips grow too complex and expensive? And, finally, could a parallel printer port be squeezed into the design with no additional parts?

A Closer Look

To answer these questions, a closer look at the 6803 is needed. Among other connections, the 6803 has pins for Vcc (+5 volt power), Vss (ground), Xtal and Extal (crystal or master clock inputs), 'E' (enable signal used to synchronize with memory or peripherals, one-quarter the master clock frequency), NMI (Non-Maskable Interrupt), IRQ (Interrupt Request) and RES (reset). We'll describe how all of these are used during the theory and construction part of this series.

One of the 6803's attractive features is that it has two input/output ports. Port 1 is a complete eight-bit parallel port (maybe for that parallel printer option?); Port 2 is a specialized five-bit port. It can be used as an ordinary parallel port, but is also usable as a timer and as an SCI (Serial Communications Interface). The SCI is the key to the functioning of The Letter Box.

The 6803 also has an internal 128-byte RAM. With its option for battery backup, this RAM can be very handy for lab or industrial control. This project won't use the backup feature, however.

The 6803 has the usual address lines 8 through 15. An important consideration in using the 6803 is the multiplexed data/low-address bus. Because the number of external connections is limited to 40 pins, the designers had to squeeze the eight data lines (D0-D7) and eight low-address lines (A0-A7) onto the same connections. The AS signal (Address Strobe) is used to let the circuit know when the address lines are changing to data lines.

The whole process of multiplexing and de-multiplexing is at first a mysterious one, and there are two major instances of it in this project: with the 6803 microprocessor (squeezing eight data and eight address lines together), and with the dynamic memory (squeezing 16 address lines onto eight pins). More about that later.

How Do You Start?

This project involves building a computer. How do you even start thinking about that? It's overwhelming.

Some of the thinking is done simply by acknowledging what you need to do — have cheap memory, a serial interface, a simple operating system, low parts count and low cost. And part of that work is done since the type of memory (64K DRAMs) and the microprocessor (6803) have been chosen to fill the essential needs. Now what?

What about memory refresh? What is it, and how is it accomplished? By now you've probably heard the analogy that dynamic memory is like a tire with a slow leak — it needs a burst of air every so often to keep it inflated. The technical characteristics of this kind of memory are such that 256 contiguous memory locations have to be read or pulsed at least every 1/500th of a second to keep the stored information reliable. Memory manufacturers specify several patterns for reading or pulsing.

Turn first to a familiar example: The Color Computer uses DRAM, but its refresh is performed by a sophisticated memory-management circuit, the Synchronous Address Multiplexer (SAM). The SAM mediates between the microprocessor (MPU) and its memory, shoots information to the video display when needed, controls a number of input/output functions and monitors the computer's memory map; it uses its free time to refresh the DRAM. For a printer buffer, that might be overdoing it. Also, the SAM is expensive ($20 or so) and incompatible with the 6803.

> ***"The whole process of multiplexing and demultiplexing is at first a mysterious one, and there are two major instances of it in this project: with the 6803 microprocessor . . . and with the dynamic memory . . ."***

One of the other often-used options is the refresh counter. This is a group of integrated circuits tied to the MPU and its master clock in such a way that when the MPU isn't using the memory, a refresh address and appropriate pulse are provided.

But refresh counters mean more hardware, and more expense! If refreshing memory means reading 256 consecutive addresses, why not do it the old-fashioned way? That is, why not have the MPU simply read 256 consecutive bytes every two milliseconds (ms)?

Here's where the 6803 has an advantage: its built-in timer and interrupt system. By calculating the operating frequency of the 6803, it can be determined how long the internal timer must count before it's time to interrupt the MPU's normal operation and make it perform another memory refresh. Table 1 shows that process in 6803 talk.

No extra hardware! Cheap, cheap, cheap! A silly idea, you say? There is a very famous and highly regarded personal computer (I'll let you guess which one) that uses precisely this technique of "software refresh."

Next time: timing, multiplexing, demultiplexing and a start on building the circuit. ☐

Table 1
A Software Refresh Scheme
for the 6803

RAM:	**Instruction:**		**Comment:**	**Cycles:**
NNNN	Interrupt IRQ2		*Output comp. —> RAM vector	(1 x12)
XX00	LDD	<$000B	*Get old output comp. value	(1 x 4)
XX02	ADDD	#OFFSET	*Add next interrupt time	(1 x 4)
XX05	STD	<$000B	*Place new out. comp. value	(1 x 4)
XX07	LDD	#$0000	*$XX07,8,9 (fetch/read/read)	(1 x 3)
XX0A	LDD	#$0000	*$XX0A,B,C (fetch/read/read)	(1 x 3)
. . . .	LDD	#$0000	*$XX0D,E,F - $XX79,A,B	(37x 3)
XX7C	LDD	#$0000	*$XX7C,D,E (fetch/read/read)	(1 x 3)
XX7F	RTI		*Return from the interrupt	(1 x10)
			Total MPU cycles in refresh routine	154
			Total MPU cycles in 2 milliseconds @ 2.4576 MHz master clock	1228.8
			Refresh overhead taken from MPU operation	12.5%

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ACCESSIBLE APPLICATIONS

Using A Spreadsheet As A File Manager

By Richard A. White
Rainbow Contributing Editor

Ah! You noticed the new title for the column. After a few weeks of discussion around THE RAINBOW offices, "Accessible Applications" surfaced. I rather like it for what it communicates in two words. The power of the computer should be accessible to the user. I think that means easy to use.

How easy? Easy enough to start simply and do something worthwhile, then, step by step, learn the harder tasks. The second requirement is that it be fairly easy to remember how to use the application. Spreadsheets typically meet these requirements. Other applications don't necessarily.

A powerful file program may let you define simple record structures, enter data, save it, reload it and review it. When it comes to printing that data in a nicely formatted report, the new user runs into a wall in the learning curve. There is a lot of complexity in describing to a computer just what is wanted.

(Richard White has a long background with microcomputers and specializes in BASIC programming. With Don Dollberg, he is the author of the TIMS *database management program.)*

Spreadsheets come off well in the printing area, since "What You See Is What You Get" — WYSIWYG for short. As long as your work looks good on the screen, it should look good printed.

On the other hand, learning the complexities of one of the CoCo file programs can be a lot simpler than trying to write a program in BASIC to do the same thing.

There are differences between programs of the same type, too. A fairly simple file manager like *TIMS* is very easy to use for small databases, but it will not open four disk files and draw selected data out of each to generate a report. For this you need something like *Elite*File*, which has some horsepower, and you need to figure out how to use it.

The word processor, even a simple one, can vastly increase one's productivity. Frankly, I would not even try to write this column without a word processor. There never was any love lost between me and the typewriter.

And, we are dealing with applications. These are computer tools to get work done. I have named three types. They handle the bulk of the work that is done on computers, but there are others: accounting software, telecommunications, inventory management, ordering, shipping, billing and so on. There are separate software packages for each of these applications. Some, however, can be done with a spreadsheet or a file manager. Indeed, a spreadsheet or file manager does nothing until the user programs an application into it. They can be considered a higher order language in their own right whose purpose is to help the user access the computer.

RAINBOW Managing Editor Jim Reed tried the loan payment template in my June column and immediately found some problems with two equations. In one case, the letter 'H' had been substituted for an up arrow and the following open parenthesis had been dropped. In the other case, the up arrow was again dropped and the letter 'C' which immediately followed had been printed in lowercase. It smells like a machine problem. Somewhere, some software is thinking the up arrow is signaling that a control code is following and we are on that trail.

A question that Jim had was how did I replicate the part that calculates the individual loan payments for each month the loan is outstanding. To refresh memories, a portion of the spreadsheet showing only two months is shown in Figure 1.

The objective was to copy the A14 . . . D16 down the spreadsheet starting in cell A17. *Elite*Calc* simply lets you copy the range to A17. You need to tell *Elite* whether or not to change the cell addresses. Since B3, the interest rate, and B5, the payment per month, are referenced for each month's calculation they should not be changed, while all the others must be. Next, you copy two months' worth at a time, then four, etc.

Figure 1.

```
 [       A       ][    B     ][    C     ][     D      ]
11-MONTH              1
12-START PRINCIPAL B2          INTEREST B12*(B3/12)
13-PRINCIPAL PYMT  B5-D12    PRINCIPAL B12-B13
14-MONTH           B11+1
15-START PRINCIPAL D13         INTEREST B15*(B3/12)
16-PRINCIPAL PYMT  B5-D15    PRINCIPAL B15-B16
```

Life is not so simple with *DynaCalc* or *VIP Calc*. They provide only a replicate function that allows you to replicate one cell to a row or column of cells. That's not what we want. Replicate can also copy a row of cells to other rows. That's closer, and we will have to settle for that in some way.

In *VIP Calc* you would replicate range A14 . . . D14 to A17. Next replicate A15 . . . D15 to A18 and finally A16 . . . D16 to A19. That handles one month. Repeat the process till you have replicated all the months you need. Jim couldn't quite imagine me doing that for a range of 36 months.

I can't imagine doing that either, but he caught me cold months after I made the spreadsheet and I could not immediately remember how I did do it. The answer is a command in *DynaCalc* called "Keysaver." Properly used, it is better called "Lifesaver."

I try to deal mainly with functions that are common to most of the CoCo spreadsheets. There are times like this where rules must be broken. Many *DynaCalc* owners need to understand it.

Simply stated, *DynaCalc* remembers all the keys you press after pressing the BREAK key. There is probably a limit, but I haven't reached it yet. After you have completed a series of command keystrokes, press '/' and 'K'. *DynaCalc* asks "times?" Type a number and press ENTER. *DynaCalc* then performs the saved keystrokes in the exact series the number of times you specify.

How does this help? Say I were to replicate range A14 . . . D14 to A17 and then moved the cursor to cell A17. If I had pressed BREAK just before starting the keystroke sequence, I could now enter /K1. *DynaCalc* would start at A17 (that's where the cursor was), call Replicate, define the start range, A17 . . . D17, define the target cell, A20, respond to the Same-Relative questions for each equation and move down to cell A20 at the end. Wow!

But, I needed more than one more replication; I needed 33. So I used /K33 and sat back to watch the screen dance. Ranges A15 . . . D15 and A16 . . . D16 were handled the same way and the whole spreadsheet was done over a period of several minutes. Other Keysaver uses include inserting or deleting bunches of rows or columns. You could change the format on all the cells in a row or column without disturbing the data or equations in the cells.

Keysaver isn't perfect. I have had infrequent problems with arrow key movements, but arrow key movements at the end of a keystroke sequence seems to work all right.

Moving onto the title topic, a spreadsheet makes a simple but effective file manager, so let's discuss some basic concepts of file management. A file is a collection of records. This brings to mind phonograph records, and you might have quite a few. You could make a file of the titles of all the albums. Widen Column A to 20 or 25 characters and type in the names into cells down the column.

OK, they are out of any logical order so there needs to be some sorting out. Spreadsheets sort by exchanging columns or rows. Everything in the row or column is swapped with the next. This is not a mindless swapping — the spreadsheet looks within a range you give it and does the sorting according to the contents of the cells in the range. At this point, to sort the album file, you would use a range in Column A to include all the titles. The sort function works from the left-most character in each name comparing characters with the next name until a mismatch is found. A swap occurs according to fixed rules.

First sorting can arrange the records in ascending order, where the smallest is first, or in descending order, where the smallest is last. OK for numbers, but which is smaller, 'A' or 'B'?

In the back of your *Getting Started With Color BASIC* manual (remember it?) is a table of ASCII values. All the characters you can type from the keyboard, and then some, are shown with a number assigned to each. That number is the ASCII value and it's that number that CoCo uses to decide if 'A' is larger than 'B'. A's ASCII value is 66 while B's is 67, so the computer thinks 'B' is bigger and you aren't going to change its mind.

Let's check out the rats in ASCII's woodpile. Here is a file of names of computer books on my shelf sorted in ascending order.

 Programming the Z80
1-2-3 A to Z
BASIC09 Tourguide
Introduction to Pascal
The C Programming Language
Computers for Technicians

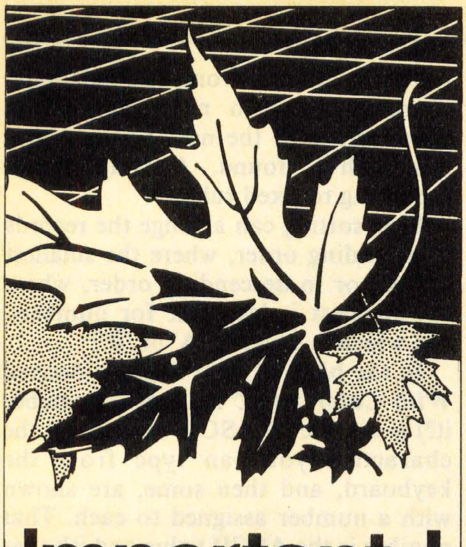
A record with a leading space always sorts to the top of an ascending sort. You may not notice the space and wonder how a record got so out of order. That's how *Programming the Z80* got to the top.

Numbers have lower ASCII values than letters so *1-2-3 A to Z* is just where it should be. By the way, the order of numbers is 0123456789. If you enter dates like 7/4/85 and 10/12/85, month 10 will sort before month 7. This is why you see computer-produced dates like 07/04/85. The leading '0' sorts ahead of '1' and puts July before October.

Finally, lowercase letters sort after all uppercase letters. There are some punctuation and special characters before the numerals and some after, but all sort before the alphabet.

The album file only contains the names of the albums. These are only in Column A. Each row is a record and each has only one field in use, the Column A cells. Let's call Column A the NAME field.

There is other data that is associated with each album such as performers,



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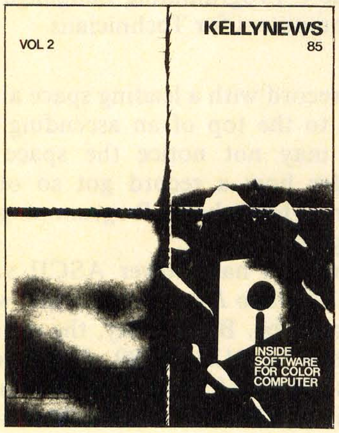

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publisher, type of music, date of publication, your rating of the performance and playing time, to name a few. A column could be devoted to each of these data types with the particular data entered in the proper column in the row with the title to which it pertains. Again, each row is a record that now would have a number of fields of data. You have done this sort of list on paper before, but you were probably not thinking in terms of records and fields when you did.

Now your sorting options become broader and you can do a number of sorts on the file. First, let's sort the whole file by type of music. Call the sort again and give the range for the column containing the music type data and include all the rows in use.

With that sort made, you might want the hard rock-type music sorted by performer. All hard rock albums should now be in one group in the spreadsheet. Sort using the performer column, but limit the range to only those rows that include the hard rock entries. You could have sorted hard rock by title or even year of publication as well.

Which way should the file be stored, on tape or disk? It's something to think about. If you have spent some time making multiple sorts, think about storing the file that way. You can always load it and resort it if it needs to be arranged differently for a specific purpose. You can even save it sorted in a number of ways to different separate files, but keep in mind that when updating time comes, you will have to update multiple files.

Don't forget the columns; they can be sorted as well without jeopardizing the integrity of the information in a record. The fields will just be in a different order in a record.

DynaCalc has a Locate Label function called by /L. *DynaCalc* then asks for a string to search for. This string is just a sequence of characters and need not be a full title or name. Using my book list, I might search for C and get four books reported. If I gave the program C only, *The C Programming Language* would be found. This provides a fairly powerful and useful search capability. Even the famous *Lotus 1-2-3* on an IBM PC cannot do this so easily.

But, the search superstar has to be *VIP Calc*. With its Locate command, you can find values, labels or the result of a formula. You can mask a string search so *VIP Calc* will ignore case. You can even have wild card characters if you don't quite know the right spelling. This combined with *VIP's* large data buffer makes the program a good candidate if you have some spreadsheet file work and would prefer to learn just one program.

If WYSIWYG (What You See Is What You Get) is a strength in a spreadsheet, it is a real weakness in a file manager. It very much limits how you can print a file. For example, mailing labels are out with the whole record on one line. You could save the records out to disk as an ASCII file and use a BASIC program to read and rearrange each record, then print it to a mailing label. If you are only going to print the list one way, the task is not particularly hard if you know BASIC. If, however, you are a user and not a programmer, it's another matter.

You can sort the columns or move the columns to get a number of fields adjacent and print those fields and not others. Say you were selecting music to play on some program and wanted to use playing time as an important selection criteria. Sort the file on the playing-time column, then group the name, performer and playing-time fields next to each other and print these fields only. This printout would be highly useful in developing the program and give just the informantion you needed.

These are rather simple types of printing. That they meet many users' needs is the remarkable thing about a spreadsheet.

Earlier, I mentioned that a BASIC program could be written to print mailing labels using data from an ASCII file of records from a spreadsheet. This approach was somewhat common a few years ago when more users were also programmers and the software available was simpler than today. Programmers would set up a user with an application on a file manager like *Profile* on a Model II, 12 or 16, then write a number of BASIC programs to use files from *Profile* to generate customized reports and other printouts.

The mailing list is a natural and the same customized output could be sent to a file and used with a mail merge program to prepare customized form letters. Next month, we will try to have a BASIC program to do at least the first task for you.

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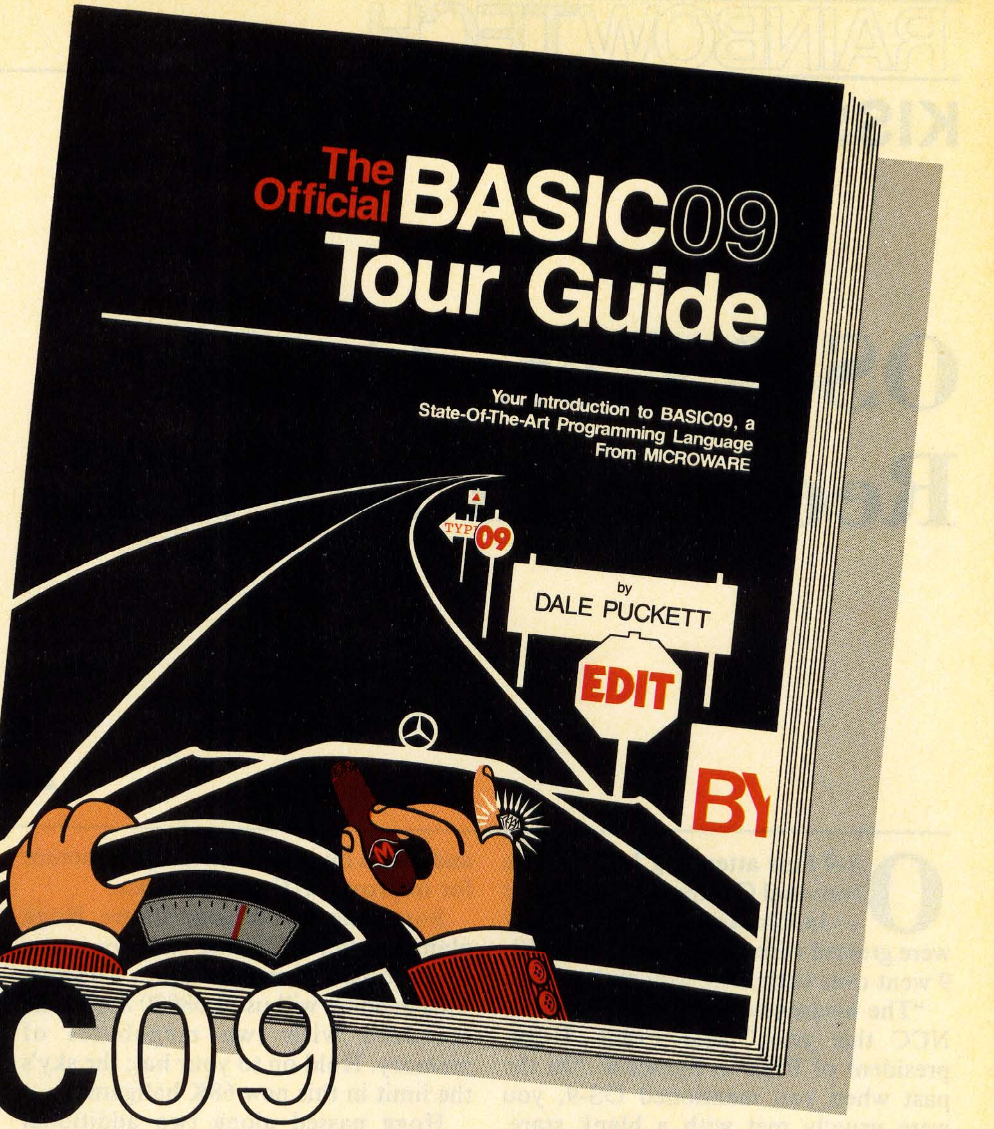
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KISSable OS-9

OS-9 Gets Good Reception At NCC

By Dale L. Puckett
Rainbow Contributing Editor

OS-9 fans attending NCC — the National Computer Conference — in Chicago during mid-July were greeted with good news. First, OS-9 went over extremely well at the show.

"The awareness was much better at NCC this year," said Frank Hogg, president of FHL in Syracuse. "In the past when you mentioned OS-9, you were usually met with a blank stare. This year, people knew what you were talking about and many of them were excited about it."

Hogg set up his "QT" in the Microware booth and was dazzling the crowd with the multi-user system that fits in a space the size of a Kleenex box. He also announced his new "QT Plus" at NCC. QT Plus features a 68000 running at 10 MHz, a 16-bit data bus, 512K RAM standard and up to 128K of ROM. It also supports four floppy disks, is expandable to one megabyte and uses a multilevel interrupt structure for improved I/O performance.

Sometime in the near future Hogg plans to offer a QT that features a new single board computer from GIMIX. This product will use a 68020 and come standard with two megabytes of memory. Hold on to your hat; the sky's the limit in this new 68K ballgame.

Hogg passed along two additional tidbits we thought you would enjoy. He reports that a new one-megabit chip — yes, you read it right, one million bits on a memory chip — is due to be released by Hitachi very soon. We may need Level II OS-9 on the Color Computer sooner than we thought. And finally, AT&T, the company that brought us UNIX, reached out and bought a QT from FHL.

New Graphics Drivers Announced at NCC

The really big news from Des Moines came in a joint announcement from Microware, Hitachi and Graphic Software Systems. The three firms joined forces to develop a complete set of graphics support modules for Hitachi's new ACRTC device — the HD63484. The new drivers conform to the proposed ANSI/ISO Virtual Device Interface (VDI) standard and give software developers a way to write portable graphics-oriented applications software. The standard itself was selected by both IBM and AT&T as the *de facto* standard graphics development environment for PCs. Now, it's available on OS-9.

"We have achieved an incredible level of integration of all the hardware and software pieces an OEM needs to build a state-of-the-art graphics system," said Ken Kaplan, president of Microware Systems Corporation. "Hitachi and Microware can now offer a total solution to manufacturers of personal computers, CAD/CAM systems, graphics work stations and similar products."

The drivers let programmers mix graphics images with text data displayed in multiple fonts. The software itself can be developed using Microware's C compiler running on a 68000-based development system or a large DEC VAX time-sharing system. BASIC, PASCAL and assembler programming languages with graphics capabilities are also available.

The HD63484 is a bit-mapped controller that contains three on-board processors. It operates at a clock speed of 10 megahertz, draws at a 400 nanosecond per dot rate and creates images of up to 4,096-by-4,096 pixels. The hardware itself can draw dots, lines, rectangles, polylines, polygons, circles and ellipses. It can also paint, fill and copy objects in 65,536 different colors.

(Dale L. Puckett is a free-lance writer and programmer who has worked with the Motorola family of microprocessors since 1976. He is the author of The Official BASIC09 Tour Guide, *published by Microware and* The Official Rainbow Guide to OS-9, *published through the Rainbow Bookshelf. He serves on the InfoWorld Software Review Board and is a chief warrant officer in the U.S. Coast Guard.)*

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Fourth Annual Microware Seminar Set for November 1-4

Speaking of Microware, don't forget to make your reservations for the Fourth Annual Microware Seminar. It gets bigger and better every year. As Jeanne Kaplan said in a flyer mailed recently, "OS-9 is emerging from its 'underground classic' status and establishing itself as a new industry standard." And just think, you knew it would all along — ever since you fired it up on your CoCo.

I highly recommend this seminar for anyone interested in exploring the inner workings of OS-9 and improving their programming skills. The titles for the planned sessions alone will make your mouth water. Here are just a few: C Tricks and Treats; Everyday OS-9 with a tutorial on the OS-9 Shell and utility commands; 6809 Technical Topics, with a demonstration that shows how to install customized drivers and related modules; 68000 Technical Topics with demonstrations showing how to adapt OS-9 to custom I/O devices and install it on new systems; Introducing NFM, a demonstration of the new OS-9 networking package; Graphics, an introduction of the new ANSI Virtual Device Interface and Graphics Kernel System running on OS-9; and finally, CoCo Special Interests, featuring news, tricks and treats for Color Computer OS-9 users.

The registration fee for the seminar is $150. For further information, contact Jeanne Kaplan at Microware, 1866 N.W. 114th Street, Des Moines, Iowa 50322, or call her at (515) 224-1929.

Users Group to Meet at Princeton RAINBOWfest

OS-9 Users Group members will have a chance to get together for a short meeting at RAINBOWfest-Princeton, thanks to Marianne Booth, RAINBOWfest coordinator. She arranged for the group to use one of the large meeting rooms immediately following the last seminar Saturday. We'll have the room for at least an hour — maybe longer. If we're lucky, we may even know the results of the election and be able to introduce you to the new officers.

Speaking of the new officers, Brian Lantz of Tampa, Fla., the author of several popular OS-9 programs for the Color Computer, surrounded himself with an impressive slate and ran for president in the group's election in September. William W. Turner III, a senior systems programmer for telecommunications support with GTE Data Services in Tampa, ran for vice president, and Steve Odneal, director of Microprocessor Management Systems at a Kansas City Bank, ran for secretary. Brian was still trying to find a candidate for treasurer when this column went to press. However, George Dorner, the incumbent and a dean at Harper College in Rolling Meadows, Ill., promised Brian he would run if there were no other candidates.

The group now has more than 800 members around the nation and has distributed more than 1,000 disks from its 37-disk software library.

Good Reviews

I've heard good comments about several of the programs we've highlighted in this column during the summer. George Dorner, OS-9 Users Group treasurer, reports in Issue Number Eight of *MOTD*, that *XCom9* — OS-9's first "freeware" program — is a real bargain.

"*XCom9*'s major advantage is its XMODEM protocol for uploading and downloading files," Dorner said. "Other notable features include an ASCII mode which strips parity, tabs and other bothersome characters. You have complete control over most of the program's parameters and can even send a break with the 6850 ACIA."

Dorner reports that *XCom9* sports built-in help messages and says the documentation is excellent. Chuck Buche and Jeff Rhodes, CoCo owners in the Chicago area OS-9 Users Group, also reported excellent performance when using the program to transfer files from a UNIX system and CompuServe. They were using the device /T2, which works with the ACIA Pak drivers in Version 1.01, and had *Word-Pak* installed. You may download the program from the DL4 database in the OS-9 SIG or obtain it for the cost of duplication from author Greg Morse, Morse SoftCode, 10871 Roseland Gate, Richmond, British Columbia, Canada V7A 2R1. It will also be available from the OS-9 Users Group Software Exchange Library in the near future. If you like *XCom9* and use it, a $20 donation is appropriate.

Dorner also had many good things to say about Steve Odneal's *Kansas City BASIC* for OS-9. Odneal was one of the first programmers to bring the FLEX operating system to the Color Computer. He started with *Santa Barbara Tiny BASIC*, which was published in Dr. Dobbs' journal several years ago, and added many enhancements. Quoting Dorner, "*KCB* looks a lot like a pretty vanilla Microsoft BASIC or Extended Color BASIC. Odneal has added PEEK, POKE, dynamic allocation of variables and string space, disk access, tokenized storage, most string functions, expandable storage space, and Shell commands from a command line or program to *Santa Barbara BASIC*."

Yet, the most important value of Odneal's *Kansas City BASIC* is the educational opportunity it presents. For $25 you get both a 23-page manual and documented source code. If you've always wondered how a BASIC interpreter worked, *Kansas City BASIC* gives you a chance to find out. And, Odneal is looking for user-developed extensions to his interpreter and promises to put the best of them into future releases. You can get *Kansas City BASIC* from Steve Odneal, 8609 East 73 Terrace, Kansas City, MO 64133.

The *OS-9 Solution*, written by Jeff Francis and distributed by Bob Rosen at Spectrum Projects, Inc. (P.O. Box 21272, Woodhaven, NY 11421), also received a good review from Dorner. Generally, Dorner's review came to the same conclusion as our report in August. However, he made a strong plea for a Level II version. Again, we quote Dorner: ". . . it might be very useful to everyone if memory were more plentiful . . . like on a Level II system. It is a significant program since it is the first such front-end utility. I hope it prospers, grows and becomes even more useful."

Are you reading, Jeff? Are you reading in Fort Worth?

Using Tandy 'C' with One Disk Drive

We received some useful information for those wanting to run the Color Computer C compiler with one disk drive from Jonathan R. Guthrie of Westerville, Ohio. It seems I got his attention in my C tutorial when I said you must have two disk drives to compile C programs. He had been getting the job done with one disk drive for more than six months. Most importantly, he was nice enough to share the information with us. Here goes:

"The problem is two-fold. First, two of the modules that make up the compiler — specifically C.PREP and C.LINK — expect to find certain data

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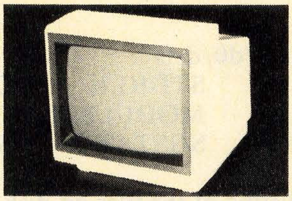

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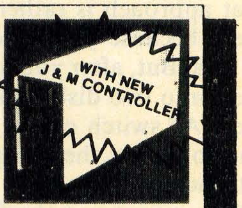
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files on /D1. And second, the blamed thing is just too darn big to fit on one — 40-track in my case — floppy disk drive.

"The first problem is the easiest to solve. I redefined the physical device that is associated with the logical device /D1. I did this using DEBUG to change the right byte in the device descriptor. I installed the procedure file below in my start-up file to do the job. Later, I made the changes and used *OS9-Gen* to create a new boot file with the modification "built in." Here is the procedure.

```
DEBUG
L D1
.<SPACEBAR> .+13
=0
Q
```

"The second problem has a simple solution — if the thing will not fit on one disk, put it on two. Unfortunately, that approach is rather hard to implement because you need to copy a lot of files. But, after you have moved your files onto two disks, you need only use the "-A" switch on the CC1 command line to divide the compilation process into two equal halves.

"You must put the file you want to compile on the first disk and — after changing your current data and execution directories to the new disk, type:

```
CC1 filename.c -A
```

"After the file has been compiled halfway, you will get the OS9 prompt back. If you do a directory at this point you will find a new file named "filename.A" in your data directory. Copy this file onto the second disk; change your current data and execution directories over to this directory and type:

```
CC1 filename.A
```

"When the compiler returns the OS9 prompt again, you will find your compiled program in your current execution directory. That's it. Good luck and happy computing."

Thank you, Jonathan, for sharing this information with our readers.

Here are the directory listings on the two disks Jonathan uses to compile C programs. First on disk number one:

```
directory of /d0
CMDS          DEFS          c.com

directory of /d0/CMDS
CC1           C.PREP        C.PASS1       C. PASS2
COPY          DEL           DIR           ECHO
LIST

directory of /d0/defs
ERRNO.H       STDIO.H       CTYPE.H       DIRECT.H
MODES.H       MODULE.H      OS9.H         OS9DEFS.A
SETJMP.H      SGSTAT.H      SIGNAL.H      TIME.H
```

Here is a listing of the files on disk number two.

```
directory of /d0   CMDS   LIB

directory of /d0/cmds
CC1           C.OPT         C.ASM         C.LINK
COPY          DEL           DIR           ECHO
LIST          PROG          KCPROG        hello
PROG2         MALE

directory of /d0/lib
CSTART.R      CLIB.L
```

Bruce A. Williamson had a similar problem and came up with yet another solution, a BASIC09 program. We'll also share it here.

Bruce owned 80-track drives and wanted the option of using either /d0 or /d1 while he was compiling his C programs. His solution was a "brute force" BASIC09 program named *cc3*. In his words, "It may not be the best example of BASIC09 programming or may not suit everyone's needs, but it is very easy to modify. One possibility I've already considered is to add a chain command at the end to chain to the *.com* file."

Bruce's program requires that C.PREP be patched and renamed D.PREP. He shows you how to do it in the listing named *cDiff*. Although he would not have had to rename his LIB and DEFS directories, he did so because he did not want to merge directories on /d0. If you do not rename your directories, you will need to change the appropriate lines in the program and patch C.PREP (see Listing named *cDiff1*. He is presently rewriting *cc3* in C and plans to make it available in an OS-9 database.

Three Prime Number Programs without GOTOs

We really woke up the sleeping giant when we published the challenge to rewrite the prime-number generating program without line numbers. This month, we'll show you several versions and share some of the dialog we received.

Our first listing was submitted by Kevin Cantwell, of the Washington State Department of Licensing. Kevin has a degree in mathematics, lives in Olympia, Wash., and has worked as a programmer for both the United States Air Force and the National Oceanic and Atmospheric Administration. He writes:

"I changed some of the logic to correspond to the apparent design attempt of the program . . . since for the version printed the 'XXXX is a prime number!' message and the last prime divisor would not be printed. The listing, *Primes2*, corrects this problem and eliminates all GOTOs. It is a bit slower and takes just under three minutes to discover that 44449 is a prime number.

"It may be worthwhile to point out that the real use of the *Primes* and *Primes2* programs are to find the prime divisors of a number, rather than to find primes. If you simply need to find out whether a number is a prime, the second program, *QPrimes*, will check it much faster. This program economizes in two ways: It stops when the first divisor is found, and it makes use of the fact that a composite — or non-prime — number must have one divisor smaller than the number's square root."

Our next challenger was Steve Goldberg of Bethpage, N.Y. He got rid of the GOTOs in the original listing by using the WHILE . . . ENDWHILE,

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REPEAT . . . UNTIL and the LOOP . . . ENDLOOP constructs of BASIC09. His procedure is named "primes."

H. Bruce Phillips of Bolingbrook, Ill., also contributed a solution that eliminated the GOTO statements in the original. His program demonstrates how to run a procedure from another procedure and he uses a procedure named "runprimes3" to run his main program named *primes3*. Bruce writes:

"I made one important change. If 'N' is the integer to be factored, then Joel Sherman's maximum trial divisor is N/2. However, it need only be SQRT(N). If a trial divisor greater than SQRT(N) is used, then the resulting quotient would be less than SQRT(N) and would have been tried previously. This results in a large savings at run time. For example, my program finds the number 44449 is prime in less than two seconds, compared with the two and a half minutes it takes Sherman's program. The eight-digit number, 12345678, factors in about 15 seconds and the number 87654321 takes about 22 seconds to factor. I also removed the recursions from Sherman's Procedure Prime. They were not needed and merely used up memory."

A Tip for Hard Disk Users

Greg Law sent us a note with a tip for people attempting to install a patch that lets you use the OS-9 *DCheck* utility with a hard disk. The patch is one of a group written by Sandy Trevor and stored in a file named *HARD.PAT* in one of the OS-9 SIG's databases. It seems the patches for *DCheck* are for OS-9 Version 1.00.00. Here are the offsets for Version 1.01.00.

Offset	Old	New
13E0	44	48
27C3	F4	A9
27C4	D5	A2
27C5	DD	CD

Essentially, the patch changes the 'D' in /D0 to an 'H' and makes it read /H0. Then, it corrects the CRC bytes in the file so OS-9 can load and execute it.

More about *Kermit*

Mark Sunderlin in Winchester, Va., sent us a note with more information about the *Kermit* communications protocol after we mentioned it several columns back. *Kermit*, a program copyrighted by the trustees of Columbia University in New York City, is available in the CoCo SIG on CompuServe. If anyone knows of an OS-9 implementation, please let us know and we'll pass the word in this column.

You may also order computer tapes of the *Kermit* program (not cassette) direct from Columbia University. However, since they are not set up to distribute free software on the scale required for a project such as this, you must pay them their cost for media, printing, postage, labor, etc. They would like a $100 donation for the complete package; $5 for a printed document such as the *Kermit Users Guide* or the *Kermit Protocol Manual.*

Their code is available for the following systems: TOPS-10, TOPS-20, IBM VM/CMS and also on a standard ASCII tape with ANSI Label, Format 'D'. Write: Columbia University Center for Computing Activities, 7th Floor, Watson Laboratory, 612 West 115th Street, New York, NY 10025.

Kermit is not necessarily better than many other terminal-oriented file transfer protocols — XMODEM for example — but it is free, well-documented and has been implemented compatibly on a number of microcomputers and mainframes. Most *Kermit* implementations also let you send files in groups with a single command.

Listing 1:

```
PROCEDURE cc5
 0000    REM cc3
 0006    REM author Bruce A Williamson
 0022    REM permission granted tto publish in Rainbow magazine
 0057    DIM inpath$,outpath$,outlin$:STRING[120]
 006B    DIM libdriv$,option$,ext$:STRING
 007A    DIM outp,pointer:INTEGER
 0085    DIM whichdriv,nopt,noasm,nolink,nocomp:BOOLEAN
 009C    PRINT "This program generates a c.com file"
 00C3    PRINT "which will perform the prep and link operation"
 00F5    PRINT "on /d0 or /d1."
 0107    PRINT "The required inputs are the c source file name"
 0139    PRINT "and the drive on which the c library is located."
 016D    PRINT "The LIB directory must be renamed CLIB"
 0197    PRINT "on drive 0 and the DEFSs must be CEFS on drive 0."
 01CC    PRINT "You also must have a version of c.prep which is pattached"
 0209    PRINT "for /d0/CEFS and renamed d.prep"
 022C    PRINT
 022E    PRINT "This program allows three options "
 0254    PRINT "The options are O=skip optimizer A= stop before assembly"
 0290    PRINT "and L= stop before linking."
 02AF    PRINT "Commas are not needed in the options but may be included."
 02EC    PRINT "Valid filename suffixes are .c .a and .r"
 0318    PRINT "Suffixes have priority over the options in case of conflict"
 0357    PRINT "Multiple source files are not allowed"
 0380    whichdriv=FALSE
 0386    nopt=FALSE
 038C    noasm=FALSE
 0392    nolink=FALSE
 0398    nocomp=FALSE
 039E    INPUT "What is the sourcefile pathname ",inpath$
 03C6    INPUT "Which drive is the LIB directory include the slash",
          libdriv$
 0400    INPUT "options",option$
 040F    IF libdriv$="/d0" THEN
 041E      whichdriv=TRUE
 0424    ENDIF
 0426    pointer=SUBSTR("O",option$)
 0432    IF pointer<>0 THEN
 043E      nopt=TRUE
 0444    ENDIF
 0446    pointer=SUBSTR("A",option$)
 0452    IF pointer<>0 THEN
 045E      noasm=TRUE
 0464    ENDIF
 0466    pointer=SUBSTR("L",option$)
 0472    IF pointer<>0 THEN
 047E      nolink=TRUE
 0484    ENDIF
 0486    pointer=SUBSTR(".",inpath$)
 0492    ext$=RIGHT$(inpath$,1)
 049D    inpath$=LEFT$(inpath$,pointer-1)
 04AC    IF ext$="a" THEN
 04B9      noasm=FALSE
 04BF      nocomp=TRUE
```

```
04C5    nopt=TRUE
04CB  ENDIF
04CD  IF ext$="r" THEN
04DA    nocomp=TRUE
04E0    nopt=TRUE
04E6    noasm=TRUE
04EC    nolink=FALSE
04F2  ENDIF
04F4  outpath$=inpath$+".com"
0503  CREATE #outp,outpath$:WRITE
050F  outlin$="echo '"+inpath$+"."+ext$+"'"
052C  WRITE #outp,outlin$
0536  IF ext$="a" THEN
0543    outlin$="copy "+inpath$+"."+ext$+" temp.a"
0565    WRITE #outp,outlin$
056F  ENDIF
0571  IF ext$="r" THEN
057E    outlin$="copy "+inpath$+"."+ext$+" temp.r"
05A0    WRITE #outp,outlin$
05AA  ENDIF
05AC  IF nocomp=FALSE THEN
05B7    outlin$="-x"
05C0    WRITE #outp,outlin$
05CA    IF whichdriv=TRUE THEN
05D5      outlin$="d.prep "+inpath$+".c >temp.m"
05F4    ELSE
05F8      outlin$="C.PREP "+inpath$+".c >temp.m"
0617    ENDIF
0619    WRITE #outp,outlin$
0623    outlin$="x"
062B    WRITE #outp,outlin$
0635    outlin$="echo c.pass1"
0648    WRITE #outp,outlin$
0652    outlin$="C.PASS1 temp.m -o=temp.i"
0671    WRITE #outp,outlin$
067B    outlin$="del temp.m"
068C    WRITE #outp,outlin$
0696    outlin$="echo c.pass2"
06A9    WRITE #outp,outlin$
```

SDISK Sports New IBM PC Disk Transfer Program

I haven't heard from D. P. Johnson for more than a year now, but from what I've been reading, the author of *SDISK* is staying busy. He has a new package named *PC-XFER* available ($45, 7655 S.W. Cedarcrest St., Portland, OR 97223, 503-244-8152) that you will find handy if you work with an IBM or clone at the office and need to carry text files home to your Color Computer.

Johnson's *PCRead* utility can read a file from an IBM PC single-sided disk of up to 40 tracks. The only restriction is the file you are copying off the IBM disk must be in the root directory. Conversely, his *PCWrite* utility writes a file into the root directory of an IBM disk so you can carry work you did at home back to the office.

The *PCFormat* utility will format a standard IBM single-sided disk. *PCDelete* will delete a file from an IBM disk. In addition to the IBM unique utilities, Johnson's *PC-XFER* package gives you utilities that read and write data from or to a standard 35-track Radio Shack

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disk. They use OS-9's standard input/output paths.

Johnson also throws in two utilities named *addlf* and *striplf*. The first adds line feeds behind every carriage return in the file. The latter does just the opposite. You'll find these two utilities handy if you transfer a lot of files between different computers because no two word processors write a file the same way. I use one of the generic transliterate utilities to do the job, but a dedicated utility would come in handy.

And while we're speaking of new software products from the Pacific Northwest, I hear that we can expect to see a full-blown relational database application language from a company named Clearbrook Software Group, Inc. (P. O. Box 8000-499, Sumas, WA 98295). Their package is named *Solomon IMS*. It reportedly features relational file access using a LINK command; multifield keys; text, integer, BCD and Date field and variable types; up to 16 files open at one time; field and record sizes limited only by your memory and OS-9; and an interactive programming environment.

```
06B3      outlin$="C.PASS2 temp.i -o=temp.a"
06D2      WRITE #outp,outlin$
06DC      outlin$="del temp.i"
06ED      WRITE #outp,outlin$
06F7    ENDIF
06F9    IF nopt=FALSE THEN
0704      outlin$="echo c.opt"
0715      WRITE #outp,outlin$
071F      outlin$="C.OPT temp.a temp.o"
0739      WRITE #outp,outlin$
0743      outlin$="del temp.a"
0754      WRITE #outp,outlin$
075E    ELSE
0762    ENDIF
0764    IF noasm=TRUE THEN
076F    ELSE
0773      outlin$="echo c.asm"
0784      WRITE #outp,outlin$
078E      outlin$="C.ASM temp.o -o=temp.r"
07AB      WRITE #outp,outlin$
07B5      outlin$="del temp.o"
07C6      WRITE #outp,outlin$
07D0    ENDIF
07D2    IF nolink=TRUE THEN
07DD      outlin$="rename temp.r "+inpath$+".r"
07FB      WRITE #outp,outlin$
0805    ELSE
0809      outlin$="echo c.link"
081B      WRITE #outp,outlin$
0825      IF whichdriv=TRUE THEN
0830        outlin$="C.LINK /d0/CLIB/cstart.r temp.r -o="+inpath$+" -l=/d0/CLIB/clib.l"
0874      ELSE
0878        outlin$="C.LINK /dl/LIB/cstart.r temp.r -o="+inpath$+" -l=/dl/LIB/clib.l"
08BA      ENDIF
08BC      WRITE #outp,outlin$
08C6      outlin$="del temp.r"
08D7      WRITE #outp,outlin$
08E1    ENDIF
08E3 10 CLOSE #outp
08EC    END
```

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> ***". . . a new package named* PC-XFER *is available that you will find handy if you work with an IBM or clone at the office and need to carry text files home to your Color Computer."***

Listing 2:

```
PROCEDURE primes2
 0000       DIM trial,number,factor:REAL
 000F       PRINT
 0011       INPUT "Number? ",number
 0021       IF number<1 OR number<>INT(number) THEN
 0037         PRINT "Must be a POSITIVE INTEGER!";
 0057         RUN primes2
 005B       ENDIF
 005D
 005E       PRINT
 0060       PRINT "**** Finding PRIME factors ****"
 0083       trial:=2
 008B       factor:=number
 0093       LOOP
 0095         IF factor/trial=INT(factor/trial) AND trial<>number THEN
 00B3           PRINT trial;
 00B9           factor:=factor/trial
 00C5         ELSE
 00C9           IF trial<factor AND trial<number/2 THEN
 00E2             IF trial<3 THEN
 00EF               trial:=trial+1
 00FB             ELSE
 00FF               trial:=trial+2
 010B             ENDIF
 010D           ELSE
 0111             IF trial>factor/2 THEN
 0122               IF number=factor THEN
 012F                 PRINT number; " is a PRIME number!";
 014B                 RUN primes2
 014F               ELSE
 0153                 PRINT
 0155                 RUN primes2
 0159               ENDIF
 015B             ENDIF
 015D           ENDIF
 015F         ENDIF
 0161       ENDLOOP
 0165       END
```

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Any Ham Radio Programs Available?

Richard L. King, Jr., WB9RLG (hangs out around 3.907 MHz between 7 - 9 p.m., daily), P. O. Box 236, St. Bernice, Ind., has a question for fellow hams. Are there any OS-9 or BASIC09 programs for ham radio use? King is looking for log programs, as well as RTTY or CW simulators. If you know of any, let us know and we'll pass the word in this column.

How to Register Your Radio Shack Software

Here's a tip that comes in handy at RAINBOWfest and other computer shows. Instead of taking the time to fill out all those registration forms by hand, bring a number of those handy stick-on address labels to the show with you. Then when you want to register for the door prize at a booth, you can slap on a sticker instead of wasting the time to write your complete name, address and phone number.

I often carry this timesaving strategy one step further and use the stick-on address labels when I fill out software registration forms and warranty applications. However, it backfired the last time I sent one of those handy software registration postcards back to Tandy in Fort Worth. Usually, they have the

Listing 3:

```
PROCEDURE QPrime
 0000      DIM trial,end_trial:INTEGER; number:REAL
 0011      PRINT
 0013      INPUT "Number to test: ",number
 002B      end_trial:=INT(SQRT(number))
 0036      IF MOD(number,2)=0 THEN
 0047        PRINT number; " is not a prime numer, divisor=2"
 006F        RUN QPrime
 0073      ENDIF
 0075      FOR trial=3 TO end_trial STEP 2
 008B        IF MOD(number,trial)=0 THEN
 009D          PRINT number; " is not a prime number, divisor="; trial
 00C9          RUN QPrime
 00CD        ENDIF
 00CF      NEXT trial
 00DA      PRINT number; "is a prime number"
 00F3      RUN QPrime
 00F7      END
```

Listing 4:

```
PROCEDURE primes
 0000      DIM trial,number,factor:REAL
 000F      DIM clearscreen:STRING[1]
 001B      clearscreen:=CHR$(12) \(* Match code with your terminal here *)
 004B      PRINT clearscreen
 0050      PRINT "P R I M E S . . . "
 0066      PRINT "ADAPTED FOR BASIC09 BY JOEL SHERMAN"
 008D      PRINT "RE-ADAPTED FOR BASIC09 BY STEVE GOLDBERG"
 00B9      PRINT
 00BB      PRINT "To exit PRIMES, enter 0 as our choice of number."
 00EF      LOOP
 00F1        LOOP
 00F3          PRINT  \ PRINT
 00F7          INPUT "Enter a number: ",number
 010F          IF number=0 THEN
 011C            PRINT clearscreen
 0121            END
 0123          ENDIF
 0125        EXITIF number>0 AND number=INT(number) THEN
 013B        ENDEXIT
 013F          PRINT
 0141          PRINT "Must be a Positive Integer!"
 0160        ENDLOOP
 0164        PRINT
 0166        trial:=2
 016E        factor:=number
 0176        REPEAT
 0178          WHILE factor/trial=INT(factor/trial) AND trial<>number DO

 0196            PRINT trial;
 019C            factor=factor/trial
 01A8          ENDWHILE
 01AC          IF trial<3 THEN
 01B9            trial=trial+1
 01C5          ELSE
 01C9            trial=trial+2
 01D5          ENDIF
```

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D.P. Johnson, 7655 S.W. Cedarcrest St.
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(For best service call between 9-11 AM Pacific Time.)

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MS-DOS is a trademark of Microsoft, Inc.

```
 01D7         UNTIL trial>factor OR trial>number/2
 01EF         IF number=factor THEN
 01FC           PRINT number; " is a PRIME number!"
 0217         ELSE
 021B           PRINT  \ PRINT
 021F           PRINT number; " is not a prime number!"
 023E         ENDIF
 0240       ENDLOOP
```

Listing 5:

```
PROCEDURE runprimes3
 0000       DIM number:REAL
 0007       PRINT CHR$(12) \(* clear the screen *)
 0022       LOOP
 0024         PRINT
 0026         LOOP
 0028           INPUT " number? ",number
 0039         EXITIF number>1 AND number=INT(number) THEN
 004F         ENDEXIT
 0053           PRINT "Must be a positive integer"
 0071           PRINT "greater than 1!"
 0084         ENDLOOP
 0088         RUN primes3(number)
 0092       ENDLOOP
 0096       END
PROCEDURE primes3
 0000       PARAM number:REAL
 0007       DIM trial,factor,quotient,root:REAL
 001A
 001B       root:=INT(SQRT(number))
 0025       factor:=number
 002D       trial:=2
 0035       REPEAT
 0037         LOOP
 0039           quotient:=factor/trial
 0045         EXITIF quotient<>INT(quotient) THEN
 0053         ENDEXIT
 0057           PRINT trial; " ";
 0061           factor:=quotient
 0069         ENDLOOP
 006D
 006E         IF trial=2 THEN
 007B           trial:=3
 0083         ELSE
 0087           trial:=trial+2
 0093         ENDIF
 0095       UNTIL trial>root OR trial>factor
 00A9
 00AA       IF factor=number OR number=2 THEN
 00BF         PRINT " --- prime number!"
 00D5       ELSE
 00D9         IF factor<>1 THEN
 00E6           PRINT factor
 00EB         ELSE
 00EF           PRINT
 00F1         ENDIF
 00F3       ENDIF
 00F5       END
```

```
Listing Diff
 Differences                            Bytes compared:    000027AC
byte        #1 #2                       Bytes different:   00000005
========    == ==
0000000D    63 64
0000135D    31 30
00001360    64 63
000027A9    2A 8F
000027AA    E9 D5
000027AB    AD 77
```

```
Listing Diff1

Bytes compared:    000027AC
Bytes different:   00000006
 Differences
byte        #1 #2
========    == ==
0000000D    63 64
0000135D    31 30
000027A9    2A A7
000027AA    E9 D6
000027AB    AD FD
```

catalog number of the software you are registering and the version number already pre-stamped on the cards. Big companies usually know how to save time, too!

As it happened, this particular card didn't have the Catalog Number stamped on the card. In my haste to slap on the stick-on label and get the card in the mail, I didn't notice the missing number. As a result, I got a nice letter from Norma Alexander in the Software Registration Department at Tandy. She explained how to register software when you lose the registration card or it is missing from your manual. I thought I should share the three methods with you. They are:

1) Send a copy of the receipt showing the original purchase with the stock number indicated.
2) Send the original title page from the software manual. It will be returned to you.
3) Ask for written verification at the store where you purchased the item.

Be sure to include the stock number and version number for each item you are registering. If you have any problems or questions about software registration, you may write Norma in care of the Software Registration Department, P.O. Box 2910, Fort Worth, TX 76113-2910, or you may call her at (817) 870-0407.

Next Month — A *DynaCalc* Tutorial

In the November issue we hope to present a tutorial on *DynaCalc*. We've been talking about the need for application programs long enough — it's time to show off an excellent one. Joe Turner at Computer Systems Center in Chesterfield, Mo., has given us a few tips and is letting us use some sample spreadsheets available to the SS-50 crowd but not the CoCo owner.

We'll list several procedure files that extend the width of the original CoCo OS-9 DIR and MDIR utilities. The procedure files show how you can actually accomplish some programming tasks with the powerful OS-9 utility command set — right from the operating system command prompt. They were contributed by Donald L. McGarry of Northport, N.Y. We'll also give you our first reaction to three new programs — the *OS-9 CBug Debugger*, the *OS-9 Text Formatter* and the *OS-9 Macro Assembler* — that just arrived from Computerware in Encinitas, Calif. Till then, happy hacking!

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Grand Junction	Colorado Periodical Distributing Co.
Montrose	Montrose Mini Mall
Westminster	Software City

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Wilmington	Normar, Inc.—The Smoke Shop

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Davie	Software Plus More
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	Software Connection
Jacksonville	Bill's CoCo Corner
	The Book Nook
	Book Town
Madison	Electronics of Madison
Melbourne	City Newsstand
	The Little Store
Miami	The News Rack
	Newsstand of Cutler Ridge
North Miami Beach	Almar Bookstore
Panama City	Boyd-Ebert Corp.
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Sarasota	Family Computers
South Pasadena	Poling Place
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Sunrise	Sunny's at Sunset, Inc.
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	Software City
	Sound Trader & Computer Center
Titusville	Computrac

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Jesup	Kannon Music
	Radio Shack
Marietta	Act One Video
St. Simons Island	Radio Shack
Toccoa	Martin Music Radio Shack

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Chicago	B. Dalton Booksellers
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	West Jackson St.
	Bob's in Newtown
	Bob's News Emporium
	Bob's Rogers Park
	Book Market
	East Cedar
	North Cicero
	West Diversey
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	Videomat, Inc.
Chillicothe	Book Emporium
Danville	Book Market
Decatur	Book Emporium
	K-Mart Plaza
	Northgate Mall
DeKalb	Appletree Computers
East Moline	Book Emporium
Evanston	Chicago-Main News
Geneseo	B & J Supply
Kewanee	Book Emporium
Lisle	Book Nook
Metropolis	Jim's Home Center
Newton	Bill's TV Radio Shack
Oak Brook	Kroch's & Brentano's
Oak Park	Kroch's & Brentano's
Paris	Book Emporium
Peoria	Book Emporium
	Sheridan Village
	Westlake Shopping Center
	Book Market
	Illinois News Service
Schaumberg	Kroch's & Brentano's
Skokie	Kroch's & Brentano's
Springfield	Book Emporium
	Sangamon Center North
	Town & Country Shopping Ctr.
Sunnyland	Book Emporium
West Frankfort	Paper Place
Wheeling	North Shore Distributors

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Greenwood	The Computer Experience
Indianapolis	Bookland, Inc.
	Indiana News
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	Elex Mart
Madison	Arcs Office Supplies
Martinsville	Radio Shack
New Haven	Advanced Color Software
Walbash	Mitting's Electronics

IOWA

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	Town Crier of Topeka, Inc.
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	Lloyd's Radio

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Hickory	C^2 Books & Comics
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Lima	Brunner News Agency
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Miamisburg	Wilke News
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	Newsy
Phoenixville	Stevens Radio Shack
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	Booked Solid II
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Ft. Macleod	Fort Pharmacy
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Nipiwan	Cornerstone Sound
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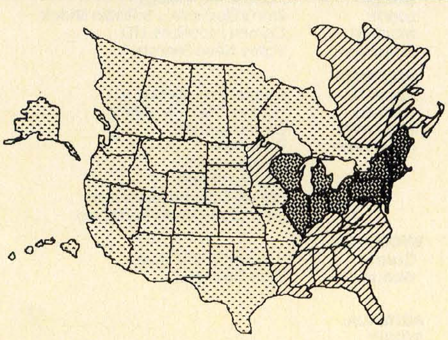

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1x, 2x, 3x

Three menu options are reserved for the most frequently used printout sizes. 1x (quarter page), 2x (half page), and 3x (full page). The 1x and 2x printouts are right-side-up on the paper, the 3x printout is rotated 90 degrees. The user can select a positive or negative image, hi-res or color interpretation (colors reproduced with user defineable grey scale), and which PMODE the graphic-to-be-printed is usually displayed in.

GREETING CARDS

The greeting card option allows the user to custom design greeting cards using both text and graphics. There are two card styles available, along with a built in "mini-typesetter" (16 different size of text, characters may be rotated, mirrored, inverted, and much more.)

SPECIAL EFFECTS

The special effects option allows the user to directly control the printing directives; ROTATION, X&Y SIZE, X/Y FLIP, X/Y GRID, X/Y FILL, TAB, WINDOW, POS/NEG IMAGE, and more! With these, the user can print multi-page banners, change the grey levels used in color printing, rotate printouts 90, 180, or 270 degrees, stretch printouts horizontally or vertically, zoom in on small areas, superimpose vertical and/or horizontal grid lines with printouts for measurements and graphing, and much much more.

PRETTY GRAPHICS

SO WHAT!

Now that you have created a library of PRETTY graphics, what can you do with them? How about printing cards, labels, and giant posters! HARDCOPY is more than just a screen print utility, compare these features with any other graphic dump program on the market;

- **Full GRAPHICOM/GRAPHICOM PART II compatibility! Loads STANDARD 6K images, GRAPHICOM pictures, and COCO MAX pictures too!**
- **BLACK & WHITE or GREY SCALE printing. In GREY SCALE printing, colors are printed as user definable patterns. Supports hi-res in all 4 GRAPHICOM display modes!**

HARDCOPY* requires a 64K Color Computer or Color Computer II, and at least one disk drive. It supports 1 to 4 disk drives, keyboard or joystick input, COLOR (grey scale) or B/W (hi-res) operation, 4 screen display modes.

*** Due to hardware differences, some features may function differently on certain printers.**

Hardcopy will be available for most of the popular printers. Additional printers will be added each month. Please specify printer and cat. number when ordering.

I.D.S. 560-G	Cat. No. 170WD	Epson MX-80	Cat. No. 172WD
Okidata 92	Cat. No. 171WD	Epson RX-80	Cat. No. 173WD
Gemini 10X	Cat. No. 174WD	Epson FX-80	Cat. No. 173WD
Gemini SG-10	Cat. No. 174WD	DMP-200	Cat. No. 175 WD

LABELS

The label printing option allows the user to create custom mailing or disk labels with professional looking results. Just load a graphic image from disk, position the proportional label window over the area to be printed. Uses standard 15/16" x 3½" tractor feed adhesive labels. Prints 1-99 labels at a time.

POSTERS

The poster option provides the user with a means of reproducing a hi-res graphic to a multi-sheet poster. Both hi-res and color printing are supported, sizes range from poster-size to mural-size to billboard-size!

DISK ACCESS

The disk option provides the user with access to standard 6K images, GRAPHICOM and GRAPHICOM PART II files, and COCO MAX files too! "GALLERY" function allows viewing of all pictures on a disk. Supports 1 to 4 disk drive system.

Have an application that **HARDCOPY** doesn't quite match? You can write it easily yourself! The hard work's been done for you, we've FULLY DOCUMENTED the **HARDCOPY** routines and added them to EXTENDED BASIC through the USR command!

Now that you've compared the functions, compare the price $29.95

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- **REQUIRES 32K EXTENDED COCO**
- **REQUIRES 1 OR 2 DRIVES** (For Disk Functions)
- **ALL MACHINE LANGUAGE!!!**

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Transfer contents of disk to tape • Transfer content of tape to disk • "Select" or "All" Option • Will automatically relocate those cassette programs that conflict with the disk operating system • Will display machine language program address • Copies ASCII, Basic, & Machine Language Programs • All contained in 1 menu driven program!!

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SPIT-N-IMAGE©

M/L Disk Back-Up Utility

There is no need to suffer the heartbreak of crashed disks any longer. Spit-N-Image will create a mirror image of your valuable disk programs which do not respond to normal back-up functions. Will also initialize and back-up in one pass. Data processing experts always insist on having a back-up — it's good practice — Don't wait!

REQUIRES 32K CC

DISK $34.95 .... Cat. No. 101CD

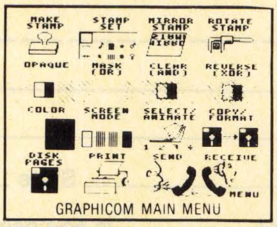
GRAPHICOM $24.95

Cat. No. 111GD

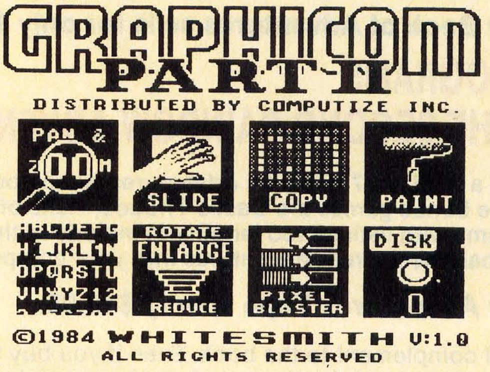
Simply stated - One of the finest graphic programs written for the Color Computer!

FEATURES

- U-S-E-R F-R-I-E-N-D-L-Y!
- 4 Display modes (Including Hi-Res red/blue artifact)
- Animate mode
- Color Palette with over 15 color patterns for use with Hi-Res artifact
- Send/Receive pictures over standard modem at 300, 600, or 1200 baud
- Supplied utility allows capturing Hi-Res screens from most COCO arcade games (even protected ones)
- Multiple Hi-Res character fonts (user, redefinable)
- Supplied utility for transferring Graphicom screens to Basic or other M/L programs
- Supplied utility for loading screens from Basic or other sources
- Built in Hi-Res SCREEN PRINT (compatible with EPSON, C-ITOH, GEMINI-10, OKI, plus Radio Shack's LP-VII, LP-VIII, DMP-100, DMP-200, and GCP-115 printers) from 110 to 9600 baud
- Slow-scan television SEND/RECEIVE options
- Many additional features, operating hints, hardware mod's and suggestions, etc



★ EASY TO LEARN GRAPHIC MENU ★
REQUIRES 64K COCO, 1 DRIVE SYSTEM, AND 2 ANALOG JOYSTICKS



Graphicom Part II is a video processing package that provides many functions that are missing in Graphicom. Here are just a few of the features provided by Graphicom Part II:

ENLARGE/REDUCE/ROTATE
Enlarge or reduce any portion of a screen by any amount, just like a photographic enlarger! Independent of the enlargement or reduction, rotate by any degree or fraction of a degree about any point on the screen.

PAINT
No more clumsy "stamping" to get your colors! Paint or "fill" any irregular area on the screen! More than 50 different colored patterns available. Unlike Extended Basic's PAINT command, painting will stop at any boundry. Undo or "Oops" function allows experimenting, and prevents time consuming mistakes. Additional paint patterns may be user-defined.

PAN & ZOOM
"Zoom in" x2, x4, or x8 on any portion of the screen to do fine pixel work. Allows editing of Graphicom character sets with ease!

TYPESETTER & FONT EDITOR
Add text in 16 different sizes with several display modes to chose from including COLORED FOREGROUND & BACKGROUND text! Edit 8x8 characters for use in the typesetter. Over 30 character sets supplied on disk. "GRAB" function allows transfer of some Graphicom character sets to Graphicom Part II format.

PIXEL BLASTER
Allows the user to easily substitute or remove colors. Widen lines, swap BLUE & RED without effecting BLACK & WHITE, etc.

GRAPHICOM PART II DOES NOT REQUIRE GRAPHICOM TO RUN!
Graphicom Part II requires a 64K extended disk basic system, it will load and save both standard BIN files and Graphicom screens, and supports 1 to 4 disk drives with keyboard or joystick (analog or switch type). All functions support color or Hi-Res operation, as well as 4 screen display modes

Cat. No. 132WD

GRAPHICOM PART II-$24.95

PICTURE DISKS $9.95

Available from COMPUTIZE

4C	Artifact color palette
5C	Large character sets drawn with master design (from Derringer Software)
6C	Same as 5C but set up as stamp set
7	Miscellaneous Art Set #1
8	Miscellaneous Art Set #2
9	Miscellaneous Ads and Examples
10	Miscellaneous Fonts
11C	Artifact color palette type fonts
12C	Art demo from WHITESMITH

Color Hi-res artworks from Whitesmith, the people that brought you Graphicom Part][, introduced by an animated marching band performing a Sousa march in 4-part harmony!

13C - GRAPHICOM PART II function demo

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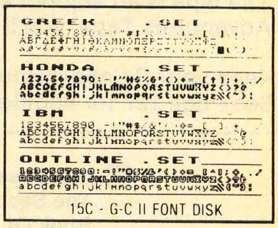

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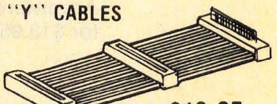

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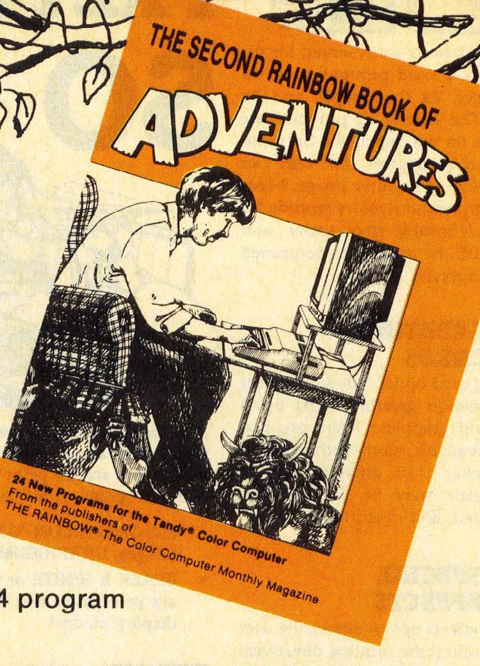
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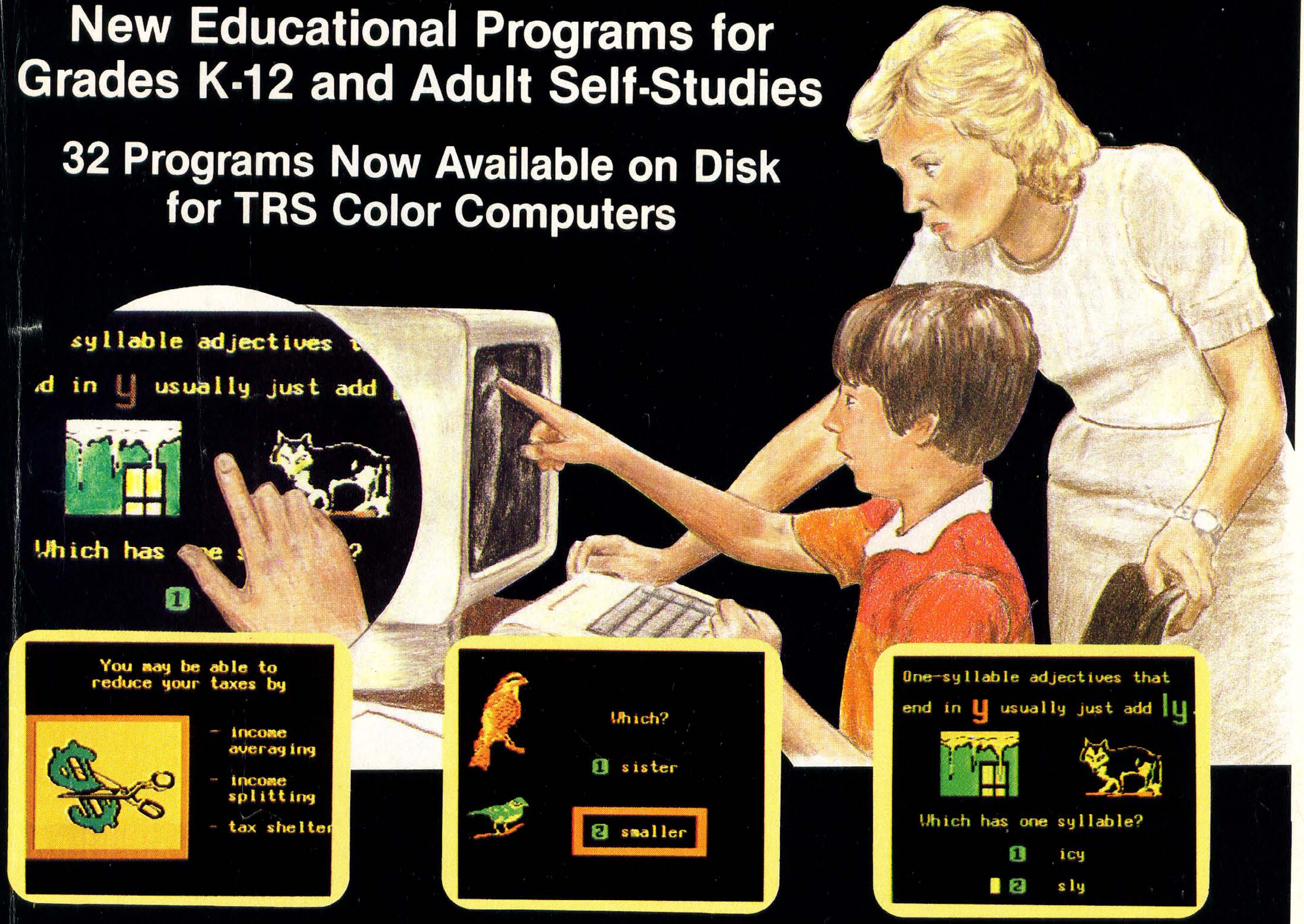
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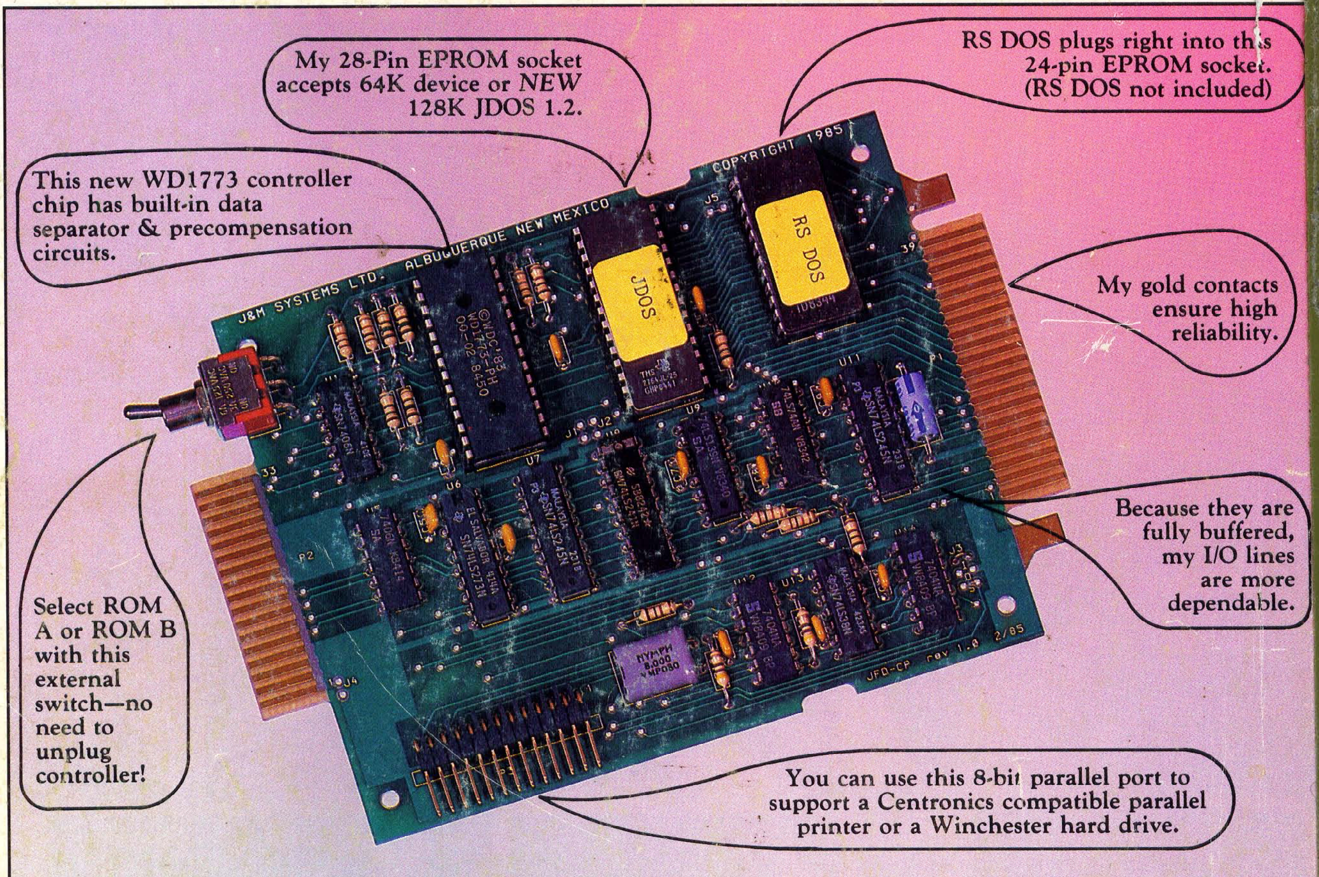
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